

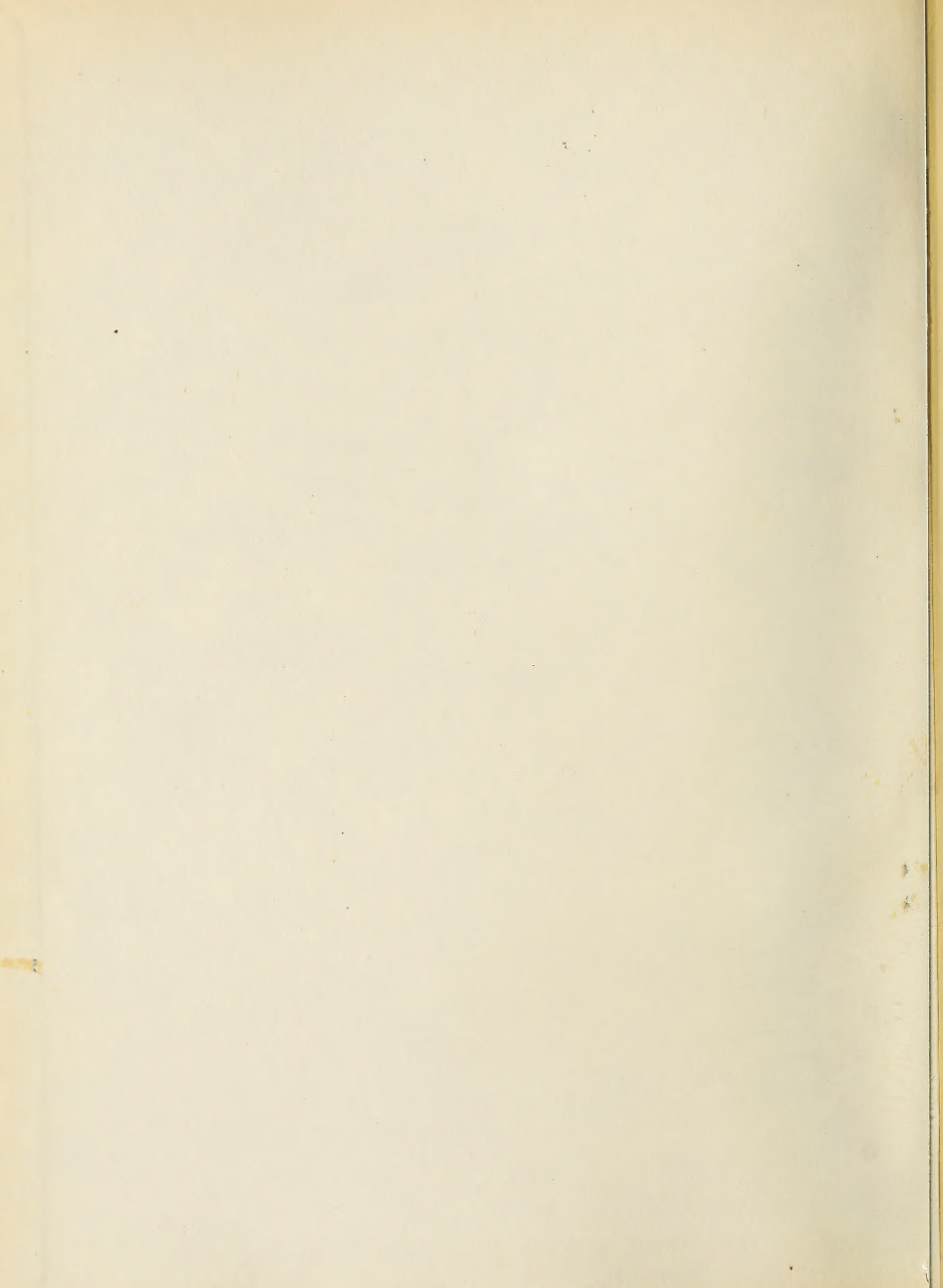
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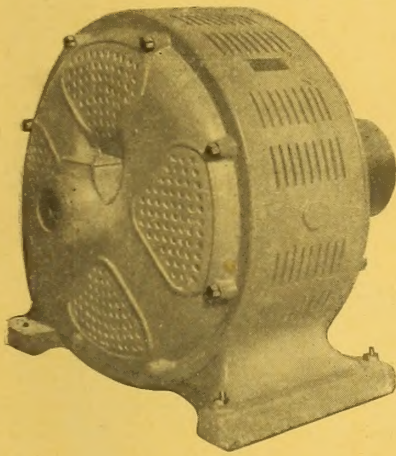
Southam







# Canadian Electrical News & Engineering Journal



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Alternating  
Current

## Induction Motors

Single Phase  
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Multi Phase  
Variable Speed

### Alternators for Power and Light

"SUPERIOR" Direct Current  
Machines to Suit all Conditions.

### Canadian Electrical & Motor Co.

Successors to United Electric Co., Ltd.

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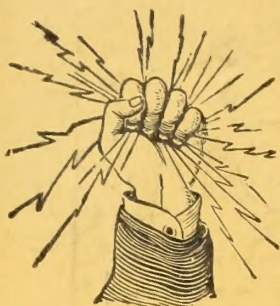
Head Office and Works: Toronto, Ont.

District Offices: Montreal Halifax Ottawa Winnipeg Vancouver Rossland



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# Eugene F. Phillips Electrical Works

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U.S. Factory: AMERICAN ELECTRICAL WORKS, Providence, R.I.

New York Office: 26 Cortlandt Street.

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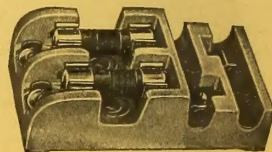
## "SHAWMUT"

# N. E. Code Standard Porcelain Bases

And Indicating Enclosed Fuses

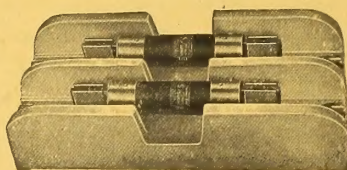


MAINLINE AND  
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OF ALL KINDS



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The Lugs do not  
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We have dropped  
the use of castings  
in our Bases

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## Stuart-Howland Company

Manufacturers of

The Most Symmetrical and Substantial Line of  
**Street Railway Overhead and Pole Equipment**

On the Market

Also Dealers in Everything Electrical.  
Largest and Most Complete  
Line in the East.

Everything Fully Guaranteed

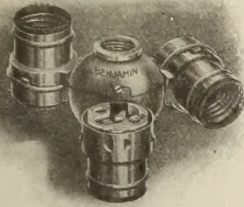
261 Devonshire  
4-5 Winthrop Street

**Boston, Mass.**



# Benjamin Adjustable Socket Clusters

NEW  
INGENIOUS  
USEFUL

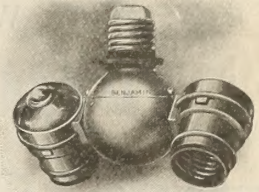


Cat. No. 853  
2-4 Lights

For use with dome fixtures, stand lamps, etc., where it is desirable to adjust and fix the lights in special relation to the sides of the dome or reflector.

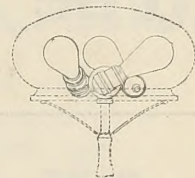
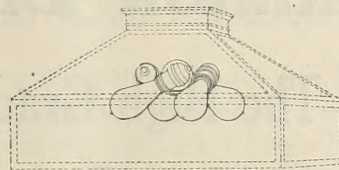
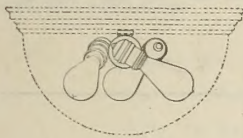
Socket may be turned to any position between two points 180 degrees apart, and locked by means of a screw.

No. 952 may be furnished series connected for low voltage Tungsten Lamps on 220-volt circuits.



Cat. No. 952  
2-4 Lights

NO TROUBLE ABOUT WIRING  
Write for Descriptive Matter and Prices



## BENJAMIN ELECTRIC MFG. COMPANY

64 York St., TORONTO

# "DIAMOND H"

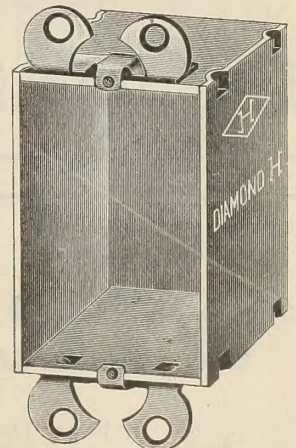
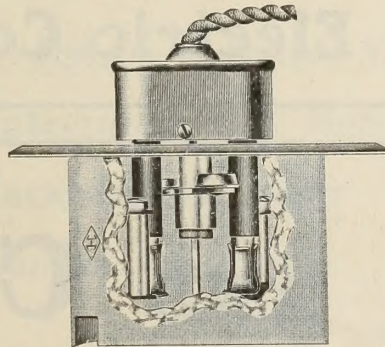
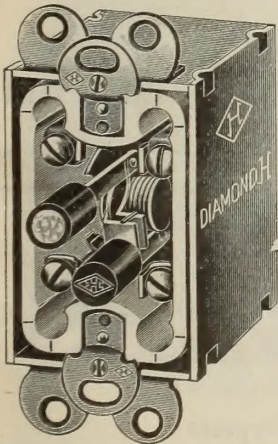
## SWITCHES

Push Switches      Rotary Switches  
Door Switches      Standard Switches



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Galvanized Steel Wall Cases  
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## C. W. Bongard Co., Ltd.,

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# **Metallic Filament Lamps** **Incandescent Lamps** **Arc Lamps**

Write for our Prices Before Ordering Elsewhere

**J. A. Dawson & Company**

Electrical Supplies and Apparatus

WINNIPEG

MONTREAL

## **The Dominion Electric Co.**

The High Grade

# **Refilled Incandescent Lamp**

is now an assured fact. Consumers are invited to make comparative tests of our lamps with the best **new** lamps.

**Write for our SELLING PRICES**

**Write for our REFILLING PRICES**

Quality guaranteed just the same as new lamps

## **WE BUY BURN-OUTS**

The only refilling lamp factory in Canada is

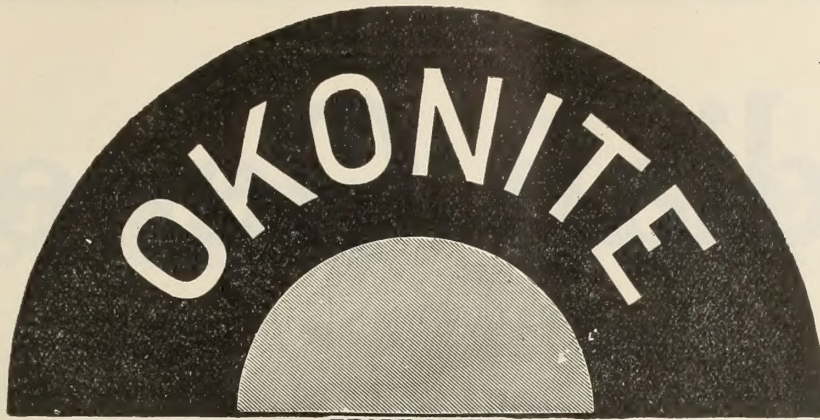
**The Dominion Electric Co., St. Catharines, Ont.**

# **WIRES AND CABLES**

of Every Description, For Telephone, Telegraph and Electric Power Purposes

**The Wire and Cable Co. - Montreal**





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Reg. U. S. Patent Office

THE STANDARD  
FOR  
RUBBER  
INSULATION

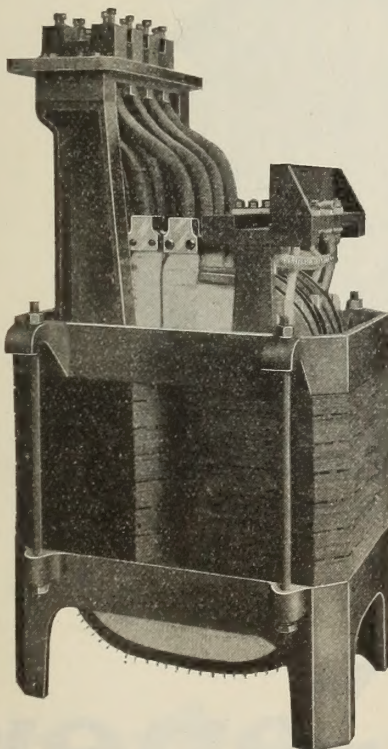
## Okonite Insulated Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Chandee } Managers.  
H. Durant Cheever }  
Geo. G. Manson, General Superintendent.  
W. H. Hodgins, Secretary.  
W. C. Chandee, Assistant-Secretary.

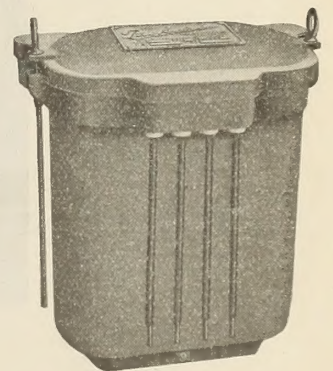
The OKONITE COMPANY, LIMITED  
253 Broadway, NEW YORK, U.S.A.



## Transformers

Special Transformers for  
Electric Reduction and  
all Power purposes.

Polyphase Induction Motors  
Integrating Watt Meters  
Incandescent Lamps  
Jandus Arc Lamps



Lighting Transformers

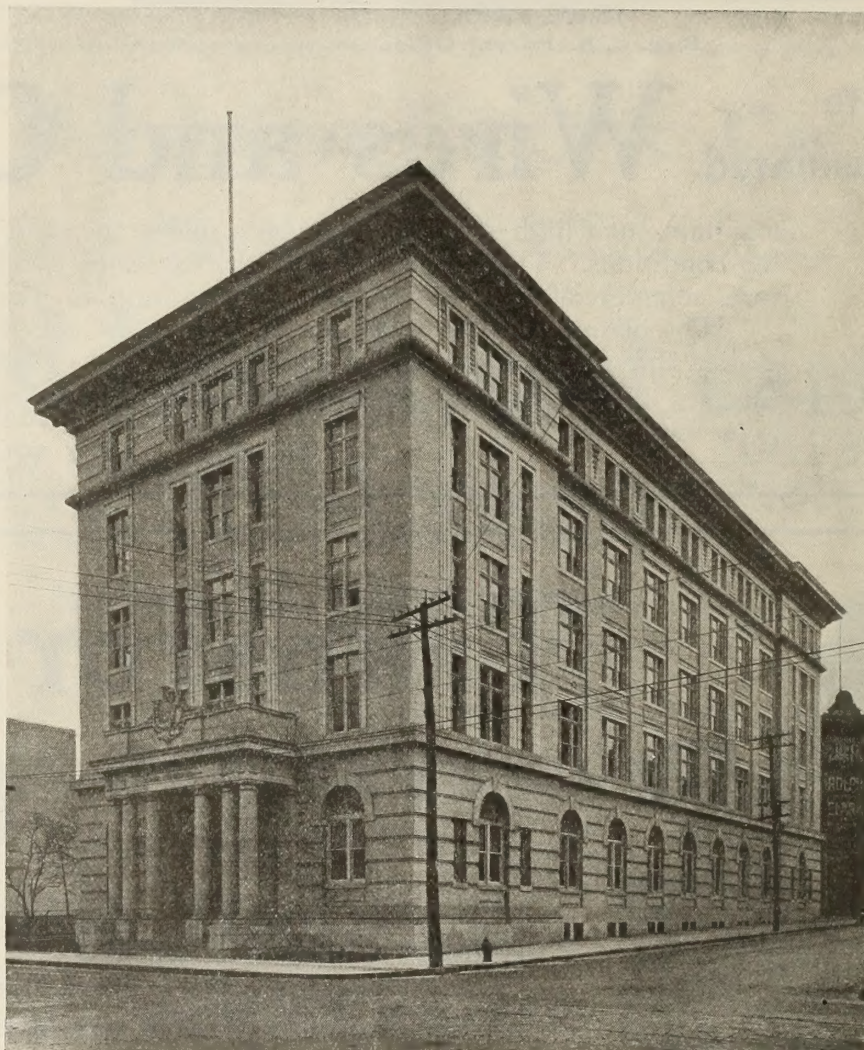
The  
**Packard Electric Co.**  
Limited

Branch Offices:  
Montreal - Winnipeg

Head Office and Works: St. Catharines, Ont.



# Canadian General



Our New Premises, 212 King Street West, Toronto

# Canadian General



# Electric Company

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# Electric Company

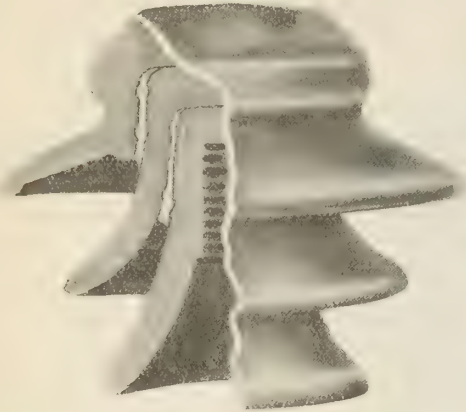
Limited



# Peerless Transformers

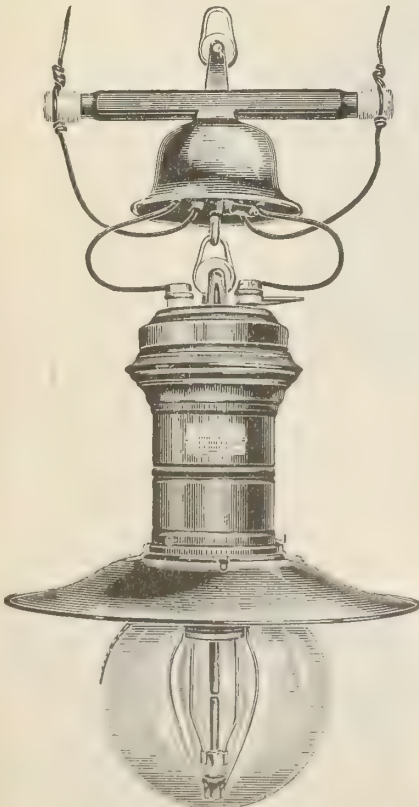


Get in line with Peerless Transformers before you place your next order. They are built right and are guaranteed the best on the market. Silico Vanadium Steel has been successfully used for two years. Not a new experiment with "Peerless".



## New Lexington High Voltage Porcelain Insulators

You can't afford to use anything but the very best insulators for your transmission line. New Lexington gas-fired insulators are of the highest quality. For your profits sake investigate their merits.



## Helios Arc Lamps

Helios Enclosed and Flame Arc Lamps are "easy sellers" because of their exceptional merits. They have been adopted in all the plants of the U. S. Steel Corporation; in the John Wanamaker stores, and the leading departmental stores of America.

# A. H. W. Joyner

6 Wellington Street East

Toronto, Ont.

SELLING AGENT FOR

Weston A.C. and D.C. Instruments  
Conduit Oil and Air Circuit Breakers  
D & W Fuse Distribution Devices  
Helios Enclosed and Flame Arc Lamps  
Anderson Railway Line Material  
New Lexington Porcelain Insulators  
Peerless Transformers and Bastian Meters



# New Year Greetings 1909

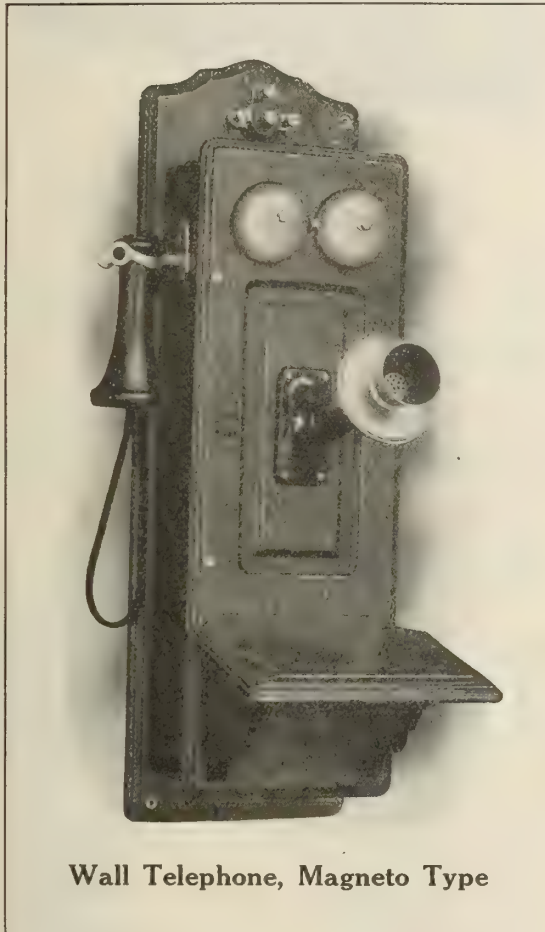
**T**HE Telephone is more and more proving itself a necessity, an economy, an essential of civilization. How convenient for those who for any cause are prevented from going about, how pleasant, how cheering to call up your friends and exchange New Year Greetings.

We take pleasure in announcing to our numerous friends and patrons and to the public in general, that the year 1908 with all of its business vicissitudes and financial stress has resulted in the placing of our Magneto Telephones and supplies with scores of Independent telephone companies and associations and hundreds of individuals throughout the length and breadth of Canada. We hold scores of letters of appreciation and recommendation from customers scattered from British Columbia to Prince Edward Island, warm expressions of satisfaction with our Telephones, Switchboards, Construction Supplies and Business Methods.

We are successfully installing automatic telephone plants in Lyons, France; Rome, Italy; Brantford and Lindsay, Ontario.

The past year has not been an easy year in which to initiate and establish a new business enterprise, but the results accomplished and the general goodwill and patronage which has been extended to us by the various organizations and our fellow citizens in general as well as the great interest which has and is being taken in our improvements and products by telephone people and experts the world over, is very encouraging and calls forth at this time an expression of our gratitude, goodwill and New Year greetings to the public in general.

We are the only Company in Canada manufacturing and selling telephones which is not owned and controlled by the Bell Telephone Company. All of our telephones and switchboards are fully guaranteed. We solicit correspondence with any and all parties interested in building up and extending telephone service.



Wall Telephone, Magneto Type

## Canadian Independent Telephone Co.

26 Duncan Street

Limited

TORONTO

# Monarch Electric Co.

Limited

579 St. Paul St., MONTREAL



TRADE MARK

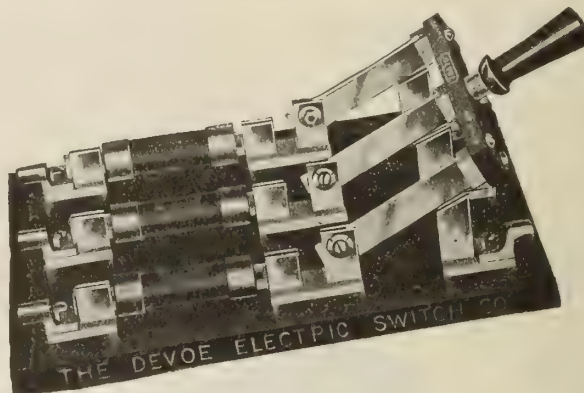
**Electrical and Mechanical  
Engineers and Manufacturers**

**Switchboards, Electrical Supplies,  
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**Special 2,000 Volt Motor  
Starting Apparatus**

# Devoe Switchboards

are just a little better than the best you have ever used. So are our switches and panel boards. We make only high grade goods.



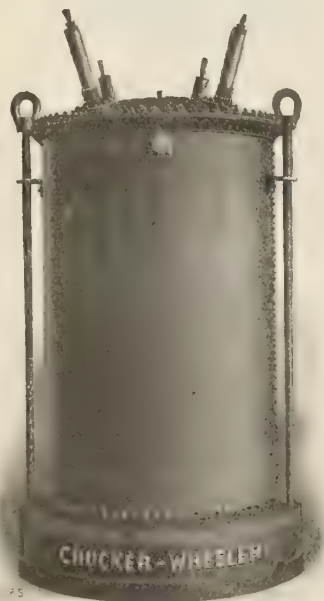
Type "B" Switch, 250 Volts. Front connected for National Electrical Code Fuses.

The above are broad statements, but we invite comparisons. No doubt you "WANT TO BE SHOWN". Give us the chance to do it.

May we send you our No. 4 catalogue?

**The Devoe Electric Switch Co.**

157 Craig Street West, MONTREAL



# C-W Power Transformers

**All Capacities  
and Voltages**

**We Solicit an Opportunity of Tendering on Your  
Requirements**

**Canadian Crocker-Wheeler Co.**

Limited

MANUFACTURERS AND ELECTRICAL ENGINEERS

**Head Office: 41 Street Railway Chambers, MONTREAL**



# Bargains in Incandescent Lamps

We have the following "Sovereign" T. H. Base Lamps to dispose of at **BARGAIN** prices.

State voltage, candle power, and number required, and we will quote exceptionally low prices. Write now before they are sold.

Quantity.	Voltage.	C.P.
524	104	8
250	110	8
200	110	10
250	104	10
50	110	5
125	52	8

**The R. E. T. Pringle Co., Limited**  
**Montreal**



Flaming Arc  
Single and Magazine Carbon Types

Write

## "Gilbert"

on your next order for

## Arc Lamps

Lamps used by His Majesty's Government the world over, should be good enough for you.

Gilbert Arc Lamps are suitable for ALL Alternating and Direct Currents, Series and Parallel operation, indoor and outdoor service.

Small watt miniature Arc Lamps and 300 hour lamps for direct current are our specialty.

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Installed on King Street Toronto.

## The Flexlume Sign Company

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St. Catharines

Ontario

## Mr. Contractor Attention!

We have the experience and the equipment to furnish

## Electric Signs

of any style.

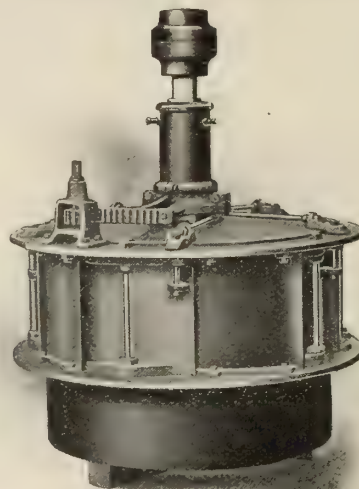
## Our Specialties

The patent 3 inch; 12 inch, and roof sign letters are unexcelled in

## APPEARANCE and ECONOMY

Communicate with us.

## The "Canadian" Turbine Water Wheel



Only Canadian Designed Wheel on the market and absolutely unequalled by any other make.  
A saving of 20 to 40% in quantity of water guaranteed and a better quality of power.

Write for description, prices and references.

## Chas. Barber and Sons

Established 1867

Meaford, Ontario



TRADE MARK



## Happy New Year

May our Black Cat with her Nine Lives be your Mascot, so your luck may have Nine Lives too.

TRADE MARK



## X Cells the Leaders

for Profitable electrical business-

Prompt Shipments from Fresh Stock by following firms:

Canadian General Electric Co., Limited  
J. A. Dawson & Co.  
John Forman  
C. H. L. Keeler Co.  
Montreal Electric Co.  
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R. E. T. Pringle Co

Toronto  
Montreal  
Montreal  
Toronto  
Montreal  
Montreal  
Montreal

If you do not find your Supply House on this list, write us for prices. Don't lose time but close your contract for

## X Cell Ignitors or X Cell Telephone Specials

in January, to save money and to receive the January Discount Remember

X Cells are Guaranteed by Us and are Money Makers for You. We have made good in 1908 and we will do better in 1909.

## ELECTRICAL SPECIALTIES Limited

TORONTO

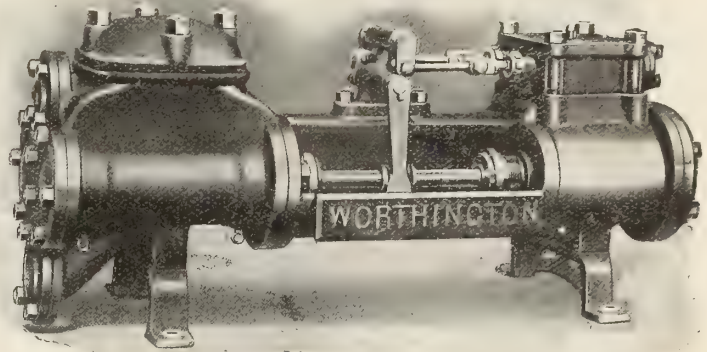
ONT.



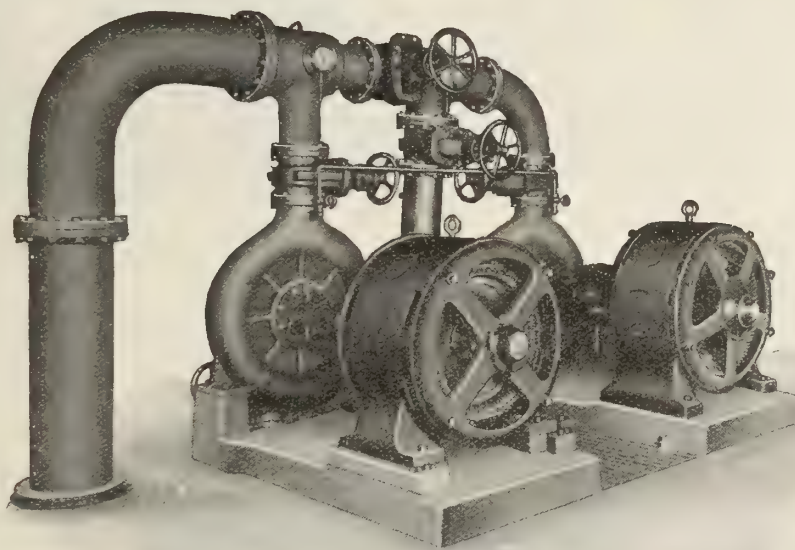
# PUMPING MACHINERY

OF ALL CAPACITIES FOR ALL PURPOSES

A LARGE NUMBER OF THESE  
PUMPS KEPT IN STOCK  
READY FOR IMMEDIATE  
SHIPMENT.



**WORTHINGTON BOILER FEED  
PUMPS**



**WORTHINGTON TURBINE PUMPS**

WATERWORKS OF THE TOWN OF LACHINE, CONSISTING OF 2 SINGLE STAGE  
8 INCH TURBINE PUMPS EACH DRIVEN BY 100 H.P. INDUCTION MOTOR.  
ARRANGED TO BE OPERATED IN SERIES FOR DOMESTIC OR IN MULTIPLE  
FOR FIRE PURPOSES. SEE BULLETIN 103.

**THE JOHN McDOUGALL  
CALEDONIAN IRON WORKS CO.  
LIMITED**

Works: Montreal. Sales Offices: New Glasgow, Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

## Personal Mention

Walter A. Pearson, of the Toronto & Niagara Power Company, has severed his connection with the company.

Mr. A. A. Wright, ex-M.P. for South Renfrew, and former president of the Canadian Electrical Association, has been appointed postmaster of the town of Renfrew.

It is rumored that Controller J. W. Baker, of Winnipeg, has been offered and will accept the position of superintendent for the Grand Trunk Pacific Telegraph Company.

Henry N. Nodd, formerly electrical engineer for the Berlin Machine Works, of Beloit, Wis., and Hamilton, Ont., has severed his connection with the company and opened a general electrical and mechanical consulting engineering office in the Provident & Loan Building, Hamilton, Ont. He has wide experience in industrial power equipments and will make a specialty in this line.

Mr. F. Eberlee, formerly connected with the Thamesville electric light plant, has just completed the construction of an up-to-date light and power plant at Orion, Mich., for the Orion Light & Power Company, of Detroit. The machinery consists of a Westinghouse 3-phase 2200-volt revolving field type alternator and is driven by a Samson water turbine with an auxiliary steam power of a Ball engine and a Wickes Bros.' water tube boiler, also a street lighting system of 64 Nernst lamps, the plant having cost \$60,000.

Mr. George A. Powell, who has been associated with the Packard Electrical Company, Limited, of St. Catharines, Ont., for the last fifteen years, has severed his connection with that company. Mr. Powell has started business for himself in the electrical line as commission broker, with offices in the Union Bank Building, Winnipeg. He will continue to represent, among other agencies, the Eugene F. Phillips Electrical Works, Limited, of Montreal, well known makers of bare and insulated copper wires and cables.

Mr. J. F. B. Vandeleur, Canadian agent for a number of English manufacturers of electrical apparatus, sailed for Europe via the Cunard liner "Lusitania" on Dec. 16th, for the purpose of spending some two months at the works of his principals, where he will have certain contracts completed under his own superintendence. He has left in charge of his affairs in Canada Mr. R. H. Nichols, who is well known to the electrical fraternity. Mr. Nichols reports business improving considerably, and that shipments of manufactured articles to Cobalt and the mining districts are heavier at the present than has previously been experienced.

The "Electrical News" was recently favored with a call from Mr. Arthur Reid, superintending engineer of water and light for the city of Lethbridge, Alta. This thriving western town, with a population of about 7,000, is making rapid progress in the direction of improvements. The electric light plant was purchased by the town a few months ago and Messrs. Smith, Kerry & Chace, of Winnipeg, have just prepared plans for a new power house. Of the present plant one 250 h.p. boiler and two generators will be retained, and in addition there will be installed three 250 h.p. boilers, one new generator of 500 k.w., etc. The new plant will have a total capacity of about 1000 k.w., but the present indications are that all the power will be required. The commercial load is heavy and all pumping of water is done by electric power. It is expected that the new plant will

cost in the neighborhood of \$100,000 and that tenders for the new equipment will be invited this month.

### Mr. W. N. Ryerson Leaving Canada

The electrical fraternity in Canada will learn with regret that Mr. W. N. Ryerson, superintendent of the Ontario Power Company, Niagara Falls, Ont., has tendered his resignation, to become general manager of the Great Northern Power Company, Duluth, Minn. Since coming to Canada Mr. Ryerson has taken a deep interest in electrical matters, and particularly in the work of the Canadian Electrical Association, of which he was elected president at the annual convention in Toronto in June last. Although removing from Canada, we are assured



W. N. Ryerson, General Manager, Great Northern Power Company, Duluth, Minn.

that it is his intention to maintain his interest in the Association to the greatest possible extent. Mr. Ryerson assumes his new duties this month, and the "Electrical News" joins with his many Canadian friends in wishing him every success.

The St. Paul Electric Power Company have bought the lighting plant of the town of Emard, Quebec, for \$149,000, from J. L. Marchand. The plant was built only two years ago and holds a franchise of thirty years for lighting the town.

The Cataract Power Company of Hamilton, Ont., have announced a reduction in the minimum rate for residential lighting from \$1 to 75 cents per month. This is a provision of the power agreement that was entered into last summer by the city with the company, but under the agreement the company was not bound to make this reduction before July next.

Whittaker & Company, Paternoster Square, London, Eng., have published a useful treatise upon transformers for single and multi-phase currents, written by Gisbert Kapp. The McMillan Company of Canada, Limited, are issuing the book in Canada. This is a second revised and enlarged edition of a similar work which first appeared ten years ago. It contains over 200 excellent illustrations and gives a very complete treatment of the theory, construction and use of transformers.



**There is one good  
Tungsten Lamp  
That's Sure**

**SUNBEAM**

**You can't afford to take a chance  
with the others**

**Rated in British Standard of Candle Power**

MANUFACTURED BY

**The Sunbeam Incandescent Lamp Co.  
of Canada, Limited**

**Main Office:**

**Dufferin and Liberty Streets, Toronto**

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# Horizontal Tubular Boilers

For Medium or High Pressure

We build them in all sizes from 10 h.p. up to 250 h. p. and larger.

High pressure tubular boilers from 80 to 250 h. p. our specialty.

Furnished complete with fixtures and fittings for setting either singly or in batteries as desired.

Our new Boiler Catalogue is interesting. Send for copy.



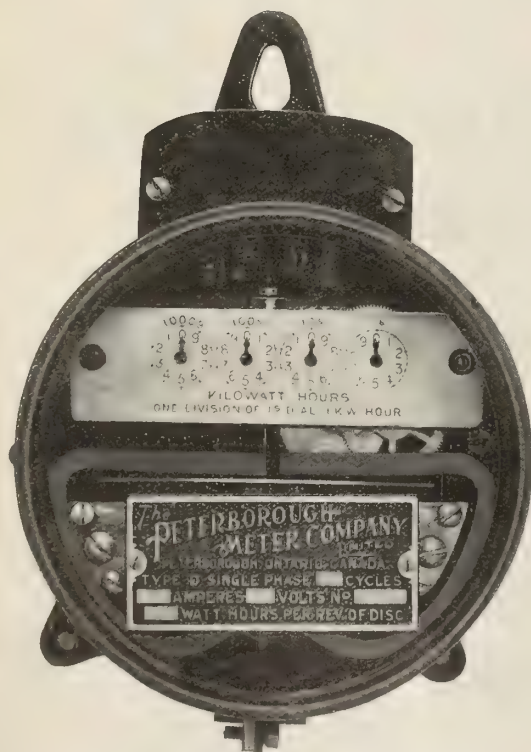
High Pressure Tubular Boiler

## The Jenckes Machine Co., Limited

General Offices: Sherbrooke, Que.

Works, Sherbrooke, Que., St. Catharines, Ont.

Sales Offices: Sherbrooke, St. Catharines, Cobalt, Vancouver, Halifax.



Can Ship Immediately

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent. overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

## John Forman

Electrical Supplies

248-250 Craig Street West, Montreal, Que.



# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIFTH OF EVERY MONTH BY  
**HUGH C. MACLEAN, LIMITED,**

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Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 1st day of the month. Changes in advertisements will be made whenever desired without cost to the advertiser, but to insure proper compliance with the instructions of the advertiser, copy and cuts should be received at least one week before date of publication.

## SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada, post free, for \$1.00 per annum. The price of subscription should be remitted by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited. Please do not send cheques on local banks unless 25 cents is added for cost of discount. Money sent in unregistered letters will be at senders' risk. Subscriptions from United States and foreign countries embraced in the General Postal Union, \$2.00 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such understanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## The Season's Greetings

At the end of another year, and the beginning of a new one, the "Electrical News" takes pleasure in wishing all its readers and patrons a very happy and prosperous 1909. The year just closing has been one of very marked anxiety, to practically all business houses, but particularly to the central station industries within range of Niagara, who have had to face, in addition to those difficulties and troubles normal to every period of business depression, the added burden of threatened competition from the Hydro-Electric Power Commission. Besides this, the very dry fall experienced this year has forced a partial suspension of operations upon a great number of water driven plants, some, in fact, being compelled to close down almost entirely, which naturally does not tend to the advantage of either the operating company, its customers, or its creditors. However, signs are not wanting that conditions are everywhere improving, so that before we get very far into the new year, business will probably be back to a point not far

below what it was fifteen months ago, and, of course, on a basis infinitely more sound than at that time.

Notwithstanding, however, the many difficulties that had to be faced during 1908, we feel that our efforts to improve the "Canadian Electrical News" have not been without success, though, of course, for any improvement which has taken place we are indebted very largely to our readers, our advertisers, and our correspondents. Naturally, though, there is still much room for further betterment, and to that end we gladly welcome any suggestions or criticisms which our readers may have to make. Correspondence on any topic relating to the



Christmas comes and Christmas goes  
And remembrance, friendship shows;  
Here's to wish you through the year  
Prosperous days and all good cheer.

electrical industries of Canada will be particularly welcome, and we cordially invite any and all of our readers to use our columns freely, assuring them that their names will not be made public unless they so desire. In the meantime we will naturally continue our best endeavors to improve the "Electrical News," and trust that every month it will become of greater interest and value to all its patrons, to whom we wish the very best and most prosperous of New Years.

The year 1909 will be a record one for business prosperity, and Canada will be in the lead.



## Experiments with Hose Streams

Some of our Canadian operating companies, perhaps more especially the street railways, have systematic schemes for the education of their employees. At the same time it is doubtless only too true that the great majority do not do very much along these lines, which is most unfortunate for all three parties concerned, viz.: the company, its men, and the general public. Of course, this state of affairs will gradually remedy itself, because without any question it is highly desirable that everyone be instructed as fully as possible regarding the duties pertaining to his position, particularly those which may arise in cases of emergency, and we will slowly but surely recognize this principle and act accordingly. In the meantime a great many organizations in the States, manufacturing as well as operating, are taking the question up actively, and have inaugurated pretty comprehensive educational campaigns for the benefit of their employees.

Perhaps one of the most typical of these is that conducted by the Pennsylvania Railway, who have decided that it would be very desirable to give their staff instruction about the handling of live wires, resuscitation from shock, etc., due to the greatly increasing use of electric light and power on and along their lines. To that end they recently had a meeting at Altoona of representatives from their various divisions, some two hundred odd being present, demonstrations being given before them on the handling of live wires, resuscitation from shock, and the results obtained when playing hose streams on live circuits. The first two subjects have already been touched upon in these columns from time to time, but experiments with hose streams are new, and consequently of great interest to everyone.

The first trials made were with a trolley wire operating at 525 volts above ground. At a distance of something like seven feet from the wire the potential between the nozzle and ground was practically nothing, being only 20 volts. The distance was then decreased by slight stages, voltage measurements being taken at each one, until a reading of about 70 volts was obtained, this with the nozzle about two feet away from the trolley wire. This showed conclusively that under all ordinary conditions a hose could be played on a trolley wire with impunity, as the voltage on the nozzle would be practically nil at all points where one would ordinarily stand. Attention was then turned to alternating lines, the first measurements being made on a circuit operating at 2,100 volts, one side of which was thoroughly grounded. The results obtained from this second set of readings were very similar to those given by the trolley line, various distances, ranging from ten feet to three and one-half feet, showing no appreciable potential between nozzle and ground, other than a slight static charge, which amounted to nothing more than a slightly disagreeable sensation when one first touched the nozzle. The third lot of experiments, made on a grounded 4,000 volt line, gave practically the same results as were obtained from the 2,100-volt circuits, from all of which it can fairly

safely be said that there is no danger in turning a clean water hose on an ordinary 2,300-volt line, unless one were extraordinarily close. All the experiments were made with solid streams, the nozzle in the first case being  $\frac{5}{8}$ -inch, and in the other two it was 1-inch. Of course the results obtained would be very different if salt water were used, though no readings were taken under those conditions. Chemical fire extinguishers would also show much higher readings to ground, in fact so much so as to probably render it impracticable to hold one on a trolley line, and quite unsafe to direct it against a circuit of 2,300 volts. The only experiment made with this class of apparatus showed 1,500 volts between the extinguisher and ground when the former was held nine inches from the 2,100-volt line. Obviously this is far beyond the safe limit, but in the event of the actual using of fire extinguishers no one is ever likely to be less than several feet away from a high tension line, in which case the results, while probably highly disagreeable, are scarcely likely to be fatal.

## Heavy Electric Traction in Canada

As has often been pointed out in the columns of the "Canadian Electrical News, this country will undoubtedly soon be the scene of some of the heaviest electric railroading in the world. In fact, the point of the wedge has already been entered, in the electrification of the St. Clair Tunnel, which, though not entirely a Canadian project, is identified with Canadian business just as much as it is with that on the other side of the line. That projects such as this, while, of course, most costly and important in themselves, are still but small indications of the enormous installations soon to come, will be readily conceded when one reflects upon the natural conditions that surround so many Canadian railways, all urging and pushing the various managements on towards the electrification of their various systems. Without a doubt the operation of all such preliminary installations as the St. Clair Tunnel will be so satisfactory as to prove to steam locomotive men, always more or less sceptical of electrical apparatus, that machinery, of this latter type can undoubtedly do all that is possible with steam locomotives, and a little more besides; further, there will be such a tremendous improvement from the passenger's point of view that roads adopting this method of traction will undoubtedly get the lion's share of the business offering.

We published in last month's issue a very complete description of the St. Clair Tunnel installation, in view of which it would be superfluous to give again any great amount of detail. At the same time, it will undoubtedly be of interest to our readers to point out the real reason for the change from steam to electric, which was this, namely, that the traffic had overtaken the capacity of the steam equipment, and consequently the tunnel had become the neck of a bottle, a weak and limiting link in an otherwise strong chain. It was impossible to increase the capacity of the steam equipment, because that only brought about an increase in the already serious prob-



lem of ventilation. Recourse was therefore naturally had to the electric type, with the result that to-day the tunnel can handle traffic far in excess of that now offering, or likely to be offering for some time to come. Further, this heavy increase in capacity has been accompanied not by increased chances of accident, but by greater safety, both to life and property, a resultant which is, of course, just as valuable as the increase in capacity, if not really more so. The reasons for this greater safety are two in number, namely, that the possibility of asphyxiation has gone entirely, now that there are no gas-producing locomotives left, secondly, air brakes can now be used, which was impossible when the trains were pulled by the old equipment. The reason for their prohibition was also the question of ventilation, in that the time required to recouple a train which had broken, and to release the brakes, was greater than the permissible safe period for which a steam locomotive might be kept in the tunnel. Obviously the absence of air brakes formed a very grave danger, still it had to be endured, as the lesser of two evils, until the installation of the electric system.

Some of the heaviest electric railroading in the world, if not the heaviest, is being carried on to-day at New York, the Illinois Central is about to install a tremendous equipment on its suburban Chicago lines; Melbourne, Australia, is talking of much the same thing; the new tunnel between Detroit and Windsor will, of course, be electric, etc., etc. But, without any doubt, Canada will soon outstrip them all, for where else can be found such magnificent electric railway propositions as the C.P.R. in Quebec province, the Grand Trunk and the C.P.R. between Buffalo, the Falls, Hamilton and Toronto, and the C.P.R. through the Rockies?

### Foreign Trade in Electrical Goods

The value of dutiable imports of electrical goods into Canada during the fiscal year ended March 31st, 1908, as compared with those of the fiscal year ended March 31st, 1907, was as follows:

	1907	1908
Electric light carbons and carbon points .....	\$ 43,033	\$ 44,900
Incandescent lamp bulbs, etc ....	Not spec.	60,123
Electric apparatus, motors, etc. . .	3,231,467	2,900,273

The exports of electrical apparatus for the year ended March 31st, 1908, amounted in value to \$98,125. For the six months ending with September, 1908, they were \$39,834, and for the month of September, 1908, \$6,780.

The Council of the University of Manitoba are calling for applications for the position of professor of electrical engineering for the university at a salary of \$2,500 per annum. The new professor will be allowed to practice his profession privately as long as it does not interfere with his duties in the university. Applications will be received by the registrar up to Feb. 15th, and the appointment will be made about June 1st.

### Comparative Costs of Power

The Toronto section of the American Institute of Electrical Engineers held an extremely interesting meeting on Dec. 18th at the Engineers' Club. The event of the meeting was a paper by Mr. H. G. Stott, past president of the Institute and superintendent of motor power for the Interborough Rapid Transit Company, New York City, upon the comparative costs of electrical power, as produced by different classes of plants. Mr. Stott's paper was accompanied by a number of useful curve diagrams which were printed and supplied to members.

The chairman, Mr. W. A. Bucke, presided at the meeting and there was a large number of members present. Mr. Stott's paper was really an address in a discursive manner, as he spoke without notes and intends to have his address written out later, so that it may be published in the proceedings. For this reason it is impossible to give an adequate resume of the address. It may be said, however, that Mr. Stott brought out a number of extremely interesting points in connection with the various costs in power production for coal and water, mechanical maintenance and operation, etc., and that he gave some exceedingly instructive comparisons of the costs of reciprocating steam plants, turbine steam plants, reciprocating and low pressure turbine plants, gas engine and turbine plants and gas engine plants. The diagrams which he presented, about 30 in all, gave some indication of Mr. Stott's enthusiasm and industry in connection with his work. As several members remarked, the preparation of these diagrams must have involved an enormous amount of work, so that it almost made them feel like looking upon Mr. Stott as something of a curiosity.

During the lengthy discussion which followed Mr. Stott's address a number of interesting applications of his ideas to Canadian conditions were presented. During a discussion upon the load factor, much divergence of opinion was evidenced in regard to the proper meaning for the phrase "load factor." Mr. Stott thereupon made the suggestion that this matter should be referred to the Standardization Committee of the Institute, because at present the phrase "load factor" really meant nothing.

Mr. Stott also made a suggestion which met with much approval and which had reference to the approaching election of officers for the Institute. He said that it was high time the Toronto section elected some of its members as officers. The ballots for nominations would be sent out in February and the Toronto section should decide upon whom they wanted to nominate for manager at least. The Institute wished to have representatives of all the sections. There were many very active members in Toronto who were well known in the Institute, and they ought to be represented among the officers.

A vote of thanks was tendered to Mr. Stott for his address, upon motion of Mr. K. L. Aitken, seconded by Professor Rosebrugh. During the discussion some of those who took part and explained interesting points in connection with their own experiences were W. A. Bucke, E. Richards, W. N. Ryerson, R. G. Black, C. B. Smith, P. W. Sothman, K. L. Aitken, Dean Galbraith, Wm. G. Angus, C. H. Mitchell, Prof. Rosebrugh, W. M. Andrew, A. L. Mudge, F. C. Smallpiece, S. Gagné, J. C. Keenan and W. A. Hare.

Another reduction in the price of electric power for Niagara Falls, Ont., was decided on at a recent meeting of the electric light committee. In future the price per horse power will be \$20 yearly. Last year the price was \$27.

# The Use of Interpole Motors, or Auxiliary Fields

An Interesting Consideration of their  
Employment by F. R. Ewart, B. A. Sc.

The use of interpoles, or auxiliary fields of any kind, is mainly to overcome commutation difficulties in machines employed under severe conditions of service. For this reason I shall first describe the process of commutation, then show the effect of induced voltages in the short-circuited coil, proceeding to show how the voltage depends on field form, and how field form is affected by armature reaction. I shall show how the effects of armature reaction may be overcome and under what circumstances an auxiliary field is necessary. And lastly I shall discuss the application of the interpole motor and its many advantages.

Figure A of fig. 1 represents diagrammatically the flow of current in an armature. The coil C carries full current in the right hand direction, and the lead L carries none until the edge of the segment S<sub>1</sub> reaches the heel of the Brush B. As the brush passes over the segment the current is gradually diverted from C through L, till half of the brush rests on S<sub>1</sub>. The current will then pass entirely through L, that is the coil is short circuited. As the brush continues its motion the current in L<sub>1</sub> will gradually be shifted to the coil C, until the toe of the brush leaves S<sub>2</sub> and the coil is carrying full current in the left hand sense. That is, the current in the coil is commutated or reversed.

This change may take place in many ways, a few of which are shown in curves 1 to 11, fig. 1. These are curves of current plotted on time interval as base, the distance between the vertical lines representing the time one commutator bar takes to pass a given point. Curve 1 shows the whole time taken in changing the current, while in curve 6 the current hangs on and reverses suddenly, i.e., very little current is diverted by the leading edge of the brush, but is impeded till it has to flow through the trailing edge. This has an effect equivalent to decreasing the width of the brush and increasing the current density. Thus the steepness of the curve indicates the current density at any point. The worst place to have high current density is at the trailing edge of the brush, as this is the point where a segment finally leaves the brush and where a spark once started will be most inclined to be drawn out and maintained. Curve 1 shows ideal commutation, giving uniform and minimum current density in the brush. This condition is most nearly realized by using brushes whose resistance is high in proportion to that of the coil, so that the ratio of currents flowing by L<sub>1</sub> and L<sub>2</sub> depends on the ratio of the surfaces of S<sub>1</sub> and S<sub>2</sub> covered by the brush. This suggests at once one good reason for the use of carbon brushes. If the resistance of the brush is low compared to that of the coil we will get commutation something like curve 9, where the coil is short circuited immediately after the edge of the brush touches its segment.

Armature coils being wound on an iron core and generally deeply imbedded in slots on it, are always highly inductive, so that it is impossible for currents in them to die down rapidly. This self-induction has the effect of producing commutation as in curve 6, causing high density at the trailing edge of the brush, a condition which we have seen to be very harmful. If we have an active *E.M.F.* in the coil which is counter to the flow of the current and will assist in reversing it, we may get something like curve 4. Evidently the introduction of such

an *E.M.F.* might be used to counteract the effect of self-induction, thus effecting a compromise between curves 4 and 6 and securing something near the straight line variation of curve 1. If, on the other hand, the *E.M.F.* be in the same direction as the current, it will tend to maintain it, and the result may be that the current will be practically undiminished, when the segment leaves the brush and thus force the whole current to arc over from the segment to the brush after they have parted. This would mean sparking of the most vicious kind, a condition which must be remedied at all costs.

For a given speed of rotation, the *E.M.F.* in a coil at any position depends on the density of the magnetic

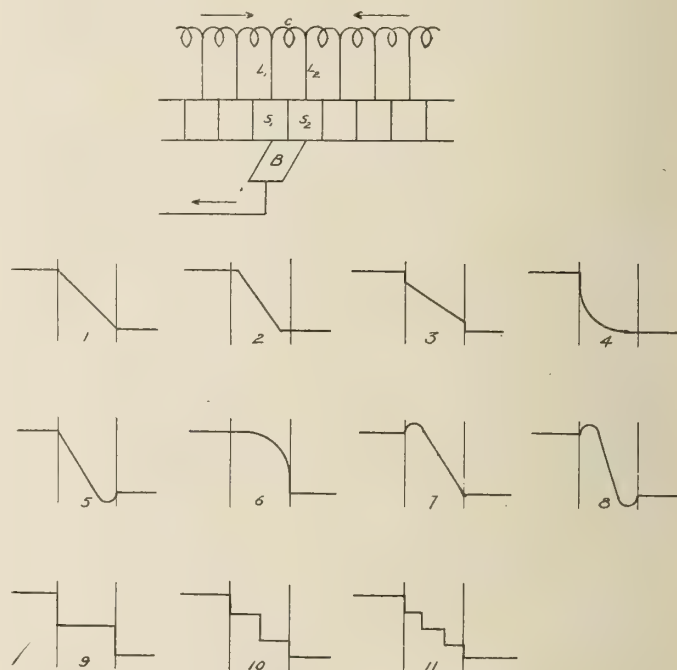


Fig. 1.

flux at that point. A curve of flux densities on angular positions as a base, is called a field form. Curve 1, fig. 2, is an example of the field form of a shunt motor at no load. The flux is nearly uniform over the face of the pole but rapidly decreases to zero at the point N in the centre of the interpolar space. The point N is called the neutral point.

Field distribution curves may be determined in three different ways:—

(1) By exploration about the commutator with a voltmeter. This method may be used whether the machine is loaded or not, but in the former case readings in the region of commutation are unsatisfactory, since they are affected by the voltage of self-induction. Thus the main benefit from such measurements is entirely lost.

(2) By means of a fluxmeter and exploring coil. An exploring coil connected to a fluxmeter or galvanometer is inserted in different positions about the field and the kick noted when the coil is withdrawn or the field current cut off. This method can only be employed when the machine is still and can therefore only be used to give the no load curve. The method is therefore of little



value in the investigation of field distortions leading to commutation troubles.

(3) The third and best method is to bring out leads to collector rings from two segments at the ends of a coil and take oscillograms of voltage. This method may be used under all conditions of speed, load, etc., and will give an absolutely faithful record of the *E.M.F.* variations in the coil. This will be the same as the field form except when the coil is commutating, where reactance voltage modifies it. But in any case the curve shows the net voltage which is employed to effect commuta-

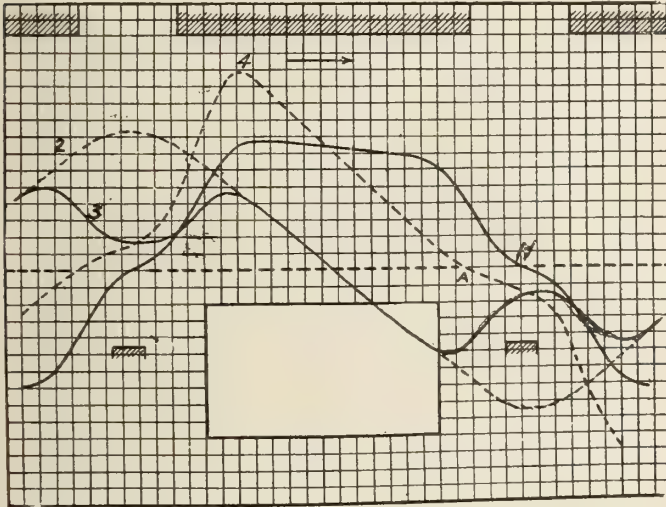


Fig. 2.

tion, and it is this net voltage upon which commutation mainly depends.

Curve 1 (fig. 2) is then the no load field form of a shunt motor and is the field produced by the main field alone, being only slightly distorted by the small no load current of the motor. This main field is constant for a definite shunt field excitation and is always in the same position. When the motor is loaded the armature produces a field of its own (curve 3) which combines with the main field to produce a resultant field as shown in curve 4.

This armature field varies in magnitude with the armature current, i.e., with the load, and its position is determined by the setting of the brushes. It is evident that an armature has a magnetization due to its own current and that the line of action of this magnetization is determined by the position of the brushes, since that is what determines the points where the current changes its sense. In fact, the armature *M.M.F.* is said to be in phase with the brushes, and if commutation were taking place along the neutral axis it would be in quadrature with the *M.M.F.* of the main field. If the machine had a uniform air gap all around the armature, the maximum flux would evidently be at the brushes and zero flux at points half way between. That is, we would have an armature flux as shown in curve 2. The difference between curves 2 and 3 is caused by the high magnetic reluctance of the circuit in the interpolar spaces.

Remembering that in the case of the motor, the flow of current is opposite to the induced *E.M.F.*, we see that we must commute at some point a little before the point of no voltage *N* is reached, if we are to have a small voltage in the commutating coil acting against the current to overcome the effect of self-induction and obtain sparkless commutation. That is we must shift the brushes back a little and commute in the "back field" or "fringe." This is, in fact, the method used to obtain a commutating field on any constant speed shunt

motor, and is always easy of accomplishment because the main field is always stronger than the armature field and a fringe (or flux beyond the pole tip) always exists, i.e., the point of no voltage is always outside the pole tip.

But in the case of a variable speed motor, where the high speeds are attained by using a greatly reduced main field, it frequently happens that there is no fringe, i.e., the point of no voltage is under the pole tip. This is the case shown by the full load curve of fig. 2. In this case it is impossible to get sparkless commutation by shifting the brushes backward because it is impossible for the brushes to catch up to the point *A*. This is because the armature flux moves with the brushes and when the brushes move under the pole tip, the arm flux at the brush is no longer than shown in curve 3, but becomes that shown in curve 2, so that the point *A* recedes before the brush and cannot be overtaken by it. It must be remembered, too, that shifting the brushes backward increases the demagnetizing effect of the armature and decreases the capacity of the motor, and therefore must not be indulged in too freely.

Evidently then under extreme conditions, such as a variable speed motor, where a back field is not available for commutating purposes, a special commutating field must be provided separately. One form of auxiliary field is the winding, which was invented in 1895 by Prof. Ryan and has been called after him. It consists of a winding placed in slots on the pole face and carrying full load current. The direction of these currents is opposite to those of the armature conductors, so that the armature flux is almost exactly counterbalanced at all points. Thus the resultant full load field form differs only slightly from that at no load. This method works excellently, but has one great objection. It is very expensive. It is still used extensively on series *A.C.* motors, where care-

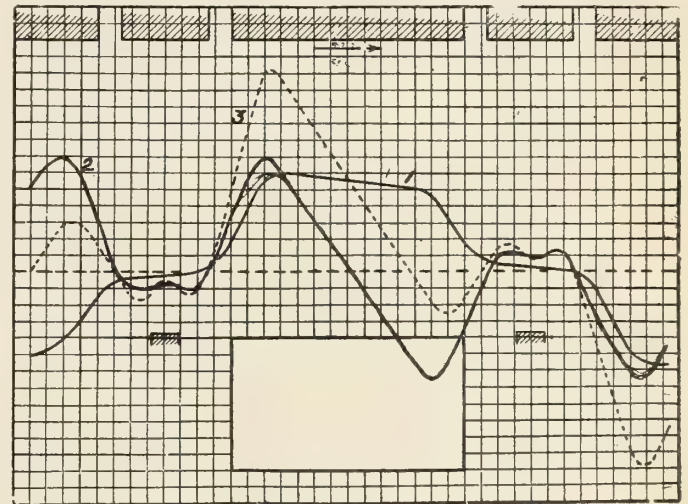


Fig. 3.

ful compensation of armature reaction is absolutely essential. But in the case of *D.C.* machines, quite as good results are accomplished much more cheaply by the use of interpoles.

These interpoles are placed in the centre of the interpolar spaces and are wound with series windings, which carry load current in such a sense that their magnetization opposes that of the armature. They are wound with sufficient turns to not only neutralize the armature flux but to produce a slight extra flux in the opposite sense, to serve as a commutating field. The field distribution curves are shown in fig. 3. Curve 1 is for no load. Curve 2 shows flux due to armature and interpoles, and curve 3 shows the resultant field form.



Since the interpoles are excited by the load current, their magnetization bears a constant ratio to that of the armature, and is therefore able to produce a commutating field in the right direction at all loads. It will be noticed that armature reaction is neutralized only in the region of commutation. This is just a narrow spot of unvarying width. "The question then might be asked, whether the same excitation is required on the interpoles for a given load at both high and low speeds. Experiment has proven that if the excitation of the interpoles is correct for high speeds it is also correct for all lower speeds. For although the same commutating flux is created at a given load irrespective of the speed, yet the *E.M.F.* generated in the short circuited coil is proportional to the speed. Thus a high *E.M.F.* is provided for the very quick reversal of the current at high speed and a much lower *E.M.F.* is provided for the slower reversal at low speed."

Fig. 4 shows the field forms at low speed, i.e., strong main field. The curves are consequently plotted on a much smaller scale than in the other figure, so that the distortion due to armature reaction and interpoles appears relatively small. The speed regulation of the interpole motor is about the same at all speeds. That is, the

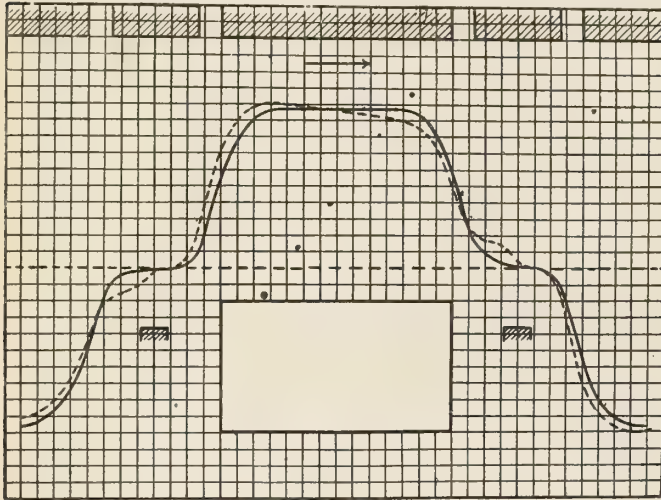


Fig. 4.

rise of speed in R.P.M. from full load to no load is nearly the same for all excitations. The armature I.R. drop at full load is a definite fraction of the terminal voltage irrespective of the excitation and must consequently tend to cause the same percentage decrease of speed from no load to full load. This drop would be greater than in the ordinary shunt motor since *R* includes both armature and auxiliary field winding and is consequently comparatively high. This, however, is compensated for by the fact that the auxiliary field tends to weaken the field at full load, thus causing a tendency for the speed to rise. This fact may be verified by a comparison of the curves in figs. 2 and 3. These two effects combine to give the machine a speed regulation which is quite as good as that of the average shunt motor of the same rating.

The efficiency for any given load is practically constant. When load is constant, armature current is constant, and then torque varies directly with the armature flux, whereas speed varies inversely as the flux. Since power output varies as the product of torque and speed, it is evident that power output is independent of field flux, i.e., it is constant for a constant value of armature current or power input. Thus the efficiency is constant. These facts are substantiated fairly well by the curves of fig. 5, which are derived from a recent test on the inter-

pole motor in the Electrical Laboratory at the University of Toronto. It will be noticed that the speed regulation seems to show a constant difference in R.P.M. from full load to no load instead of a constant percentage, the variation seeming to be about 60 or 70 R.P.M. for all speeds.

The greatest application of the interpole motor is for machine tool drive. In fact it was for this class of work that the interpole motor was developed, and its advantages for this and other work were brought to the notice of the engineering profession. "The requirements of a variable speed drive demand a motor, in which all the speed variation desired may be obtained in the motor itself without the necessity of either a variable voltage supply or a mechanical speed changing device." Evidently the interpole motor fits these requirements exactly. The elimination of the multi-voltage system effects

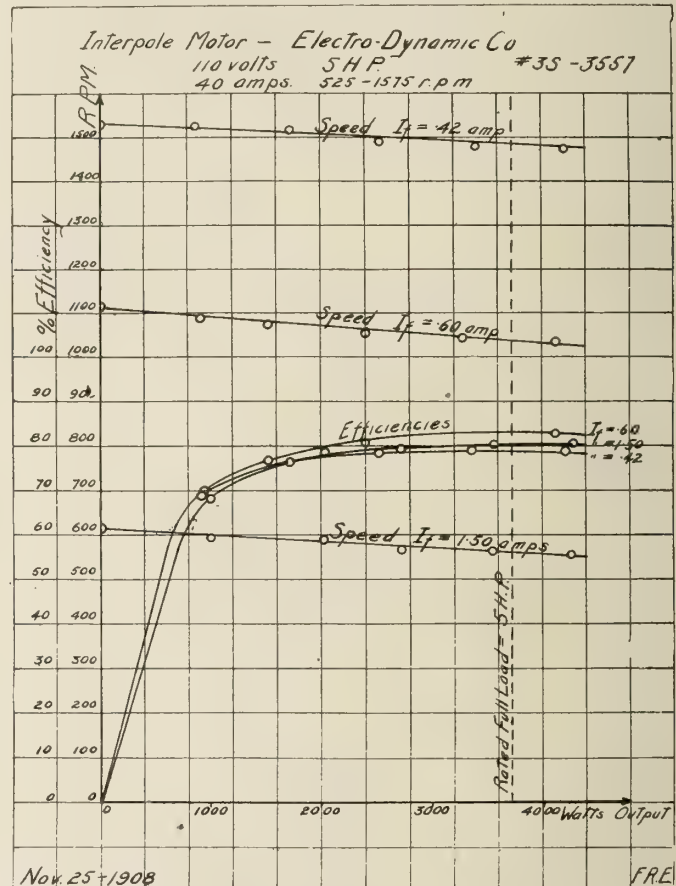


Fig. 5.

a great saving in wire, and tends to simplicity in both the generation and application of power. The advantage of a uniform speed gradation, over the wide speed changes effected by any mechanical device, need scarcely be emphasized. The speed ratios employed in practice vary all the way from 2-1 to 6-1.

The motors are generally handled by controllers of the drum type, having contacts for line, armature, and starting resistance on the drum and a field rheostat at the bottom, whose arm is keyed to the main spindle and moves with it. The contacts of the drum are so arranged that the armature polarity may be reversed, thus changing the sense of rotation. This also reverses the polarity of the auxiliary field, thus ensuring a commutation field that is always in the proper sense. One common form of controller has 16 forward running positions and 6 backward.

It is common practice to use resistance between



points of such values, that the successive speeds are in geometric progression. Thus for 16 running speeds and a 3-1 ratio we have a step to step variation of  $\sqrt[3]{3}=7.6\%$  and for 6.1 ratio  $\sqrt[5]{6}=12.7\%$ . The controller may be mounted in any convenient place and position, and with long lathes is frequently mounted on the tool base so that the workman may always control the speed while standing close to his work.

Several special advantages are claimed for the use of variable speed motors in machine shop work. (1) Elimination of line shafting; this not only saves considerable power, but gives greater convenience and flexibility in the placing of machines. (2) Safety and cleanliness; belting is always more or less dangerous and noisy and inclined to throw oil and dust. (3) Improved and cheapened product; machine work is always cleaner cut when turned out at its proper speed. Then, too, the workman can push the work well up to the safe limit and loses no time in gear changing, etc. The Firth-Sterling Steel Company found that they were able to produce 46 per cent. more work from interpole motor driven machines than from corresponding belt driven machines in the same time.

Another important use for interpoles is on railway motors. They are found to have a good effect on commutation, preventing most of the arcing and flashing which so frequently occurs when the motor is starting or is subjected to a heavy momentary overload of any kind. One great advantage of the interpole railway motor rests in the fact that the improvement in commutation permits much higher voltages to be used with safety. E. H. Anderson, designing engineer of the G. E. Company, claims that the commutation is better on an interpole motor at 1200 volts than on a corresponding type without interpoles at 600 volts. He claims that 2500 volts per motor would be quite possible; so that by using two motors in series in a car, and a double track system having the rails as a grounded neutral, 10,000 volts between trolleys might be realized. This would aid materially in the solution of the problem of long interurban lines.

Interpoles have also been frequently applied to generators on account of the advantages gained in regulation and commutation. The interpole motor has many advantages besides improved commutation, though most of them are the direct result of this improvement.

(1) A cleaner and safer motor on account of the reduction of carbon and copper dust from brushes and commutator.

(2) Increased life of brushes and commutator.

(3) Lower core densities may be used and less iron, hence smaller iron losses; also smaller commutator losses. Thus a higher efficiency.

(4) Heating instead of commutation becomes the determining factor in the output of the machine, so that every pound of material may be worked to its greatest limit.

(5) The permissible reduction of iron raises the proportion of copper to iron, i.e. makes it "a copper machine, not an iron machine." Thus a smaller and neater motor, though probably not any cheaper.

(6) Possibility of higher voltages.

(7) Greater facility in design.

(8) Possibility of increasing service capacity of motors by use of forced ventilation.

(9) Gives a perfectly reversible motor.

"It would probably be impossible to construct a commercial 5 H.P. shunt motor which could be suddenly reversed at full load without producing any sign of sparking, yet when commutating pole motors are subjected to such treatment the resultant sparking is not noticeable."

## The Montreal Lighting Situation

The contract under which the light for the city streets is supplied by the Montreal Light, Heat & Power Company terminated on Dec. 31. The gas lighting contract will terminate in May, 1910. In order that a new contract might cover both forms of lighting, the city recently asked for a renewal of the electric franchise from Dec. 31st until May, 1910. This was refused by the power company, which offered an extension of two months, until February next, the price for the lights during the extension to be the price agreed on after arbitration for a new contract. If no new contract is made, the company will charge the city the regular private rates for the two months' service.

A special meeting of the City Council after discussing the situation decided to accept the submission of the question of price to arbitration.

The company had notified the city that it could not, after the close of the present year, supply arc lights for street lighting at less than \$75 per annum. For some years past the city has been paying \$60.

At the meeting it was agreed that it was useless for the City Council to try and enter upon any municipal lighting plant scheme at present. The situation was such that the corporation had not power from the Legislature to set aside funds for such a project.

The price to be paid is to be computed by the arbitrators on the following basis: (1) The cost of power purchased by the company; (2) the losses in transmission and transforming; (3) the cost of carboning, repairs, attendance and patrol; (4) a fair allowance for office and general expenses; (5) ten per cent. on the proportionate value of that part of the company's plant used in the lighting of the city; the company to use its present lamps, poles and circuits. All additional lights ordered by the city to be charged to the city and be the property of the city; (6) A deduction to be allowed for the reselling of power used by the city at night and resold by the company during the day, the deduction to be based fairly on the preceding items; (7) To the above to be added 5 per cent. for a profit to the company; The price so determined to be that to be paid to the company from Dec. 31st, 1908, to Dec. 31st, 1910.

The company in a reply to the city's proposal suggested as a "modus vivendi"—(1) That the Power Company undertake to continue lighting the present lamps of the city for one year at the prices to be fixed by arbitration, the arbitrators to include everything incidental to the street lighting except interest on the capital stock of the company, it being understood that in the event of a ten-year contract, the company will accept \$75 per lamp, even should the arbitrators decide on a higher price.

(2) Or, the company will continue operating the present lights until the 1st of May, 1909, provided authority is given to the mayor, the city treasurer and the city comptroller to fix a price to be paid by the city for street lighting after having verified the cost from the company's books, etc., for a contract for ten years, from the 1st of January, 1909—it being understood that the capital stock of the company will not be taken into consideration in arriving at their valuation, only the value of the plant, generating and operating expenses, maintenance, depreciation, etc., plus a profit of 5 per cent.

(3) Or, the company will supply the city with the necessary electric power to do its own street lighting, at the same rates as are paid by the largest consumers, and will rent the use of its present lighting plant to operate same at a rate to be fixed by arbitration, for a contract of ten years, from the 1st of January, 1909.



# Equipment of the Soulanges Power House

## Description of the Montreal Light, Heat and Power Company's Latest Plant.

The Soulanges power house of the Montreal Light, Heat & Power Company is the latest water power plant to be built by the company. It is situated near the village of Cedars, Que., on the St. Lawrence River, about 35 miles west of Montreal. The development consisted of digging a canal 2,800 feet long, 300 feet wide and 20 feet deep to tap the main Soulanges Canal at a point about half a mile west of lock No. 4. The dam and head gates have been erected at the power house end of this canal. The dam is of reinforced concrete construction with six storey gates for the water wheel chambers, four being for the main units and two smaller ones for the exciters. These gates will be operated by electric motors and are arranged so that by means of clutches one motor may be made to operate either of two gates. In those of the large wheel chambers are installed Allis-Chalmers-Bullock turbines of 5350 H.P. capacity operating under a head of 50 feet. These are of the Francis type, having four runners on one shaft, discharging into two draft tubes. The shaft of these turbines extends through a water-tight wall into the main generator room



Generating Station, showing Head Gates and Dam.

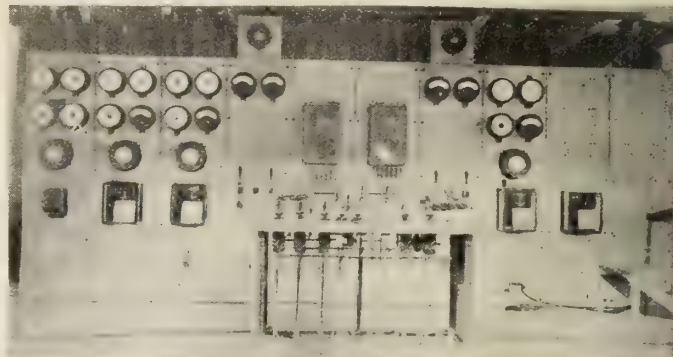
and is direct connected to a 3750 K.W., 4000-volt, 60-cycle, 3-phase revolving field alternator.

In the smaller wheel chambers are installed 300 H.P. turbines, which are direct connected to 150 K.W. exciters. The dam and power house are designed for four 5000 H.P. units, but only three are being installed at present.

From each generator cables are laid to electrically operated oil switches, which are installed in concrete cells at the bottom of the concrete bus bar structure, passing from there to the main bus bars, and from there, through disconnecting switches, to the transformers. The transformers, seven of which are installed, are of 2500 K.W. capacity, 4000-4400 volt, and are delta connected on both sides. They are arranged in two banks, with one spare one for an emergency, and are placed in concrete cells, holding one transformer, on the main generating floor. They are of the oil-insulated, water-cooled type, and are piped for water supply, oil supply, water discharge and oil discharge pipes. The oil discharges into a large tank capable of holding about 2,000 gallons, from where it may be pumped to any transformer or discharged into the tail race in case of fire.

The station is laid out as two complete plants, which may be operated either separate or in parallel. All the bus bars, both high and low tension, are broken through oil switches, so that two generators, one exciter, one bank of transformers and one line may constitute one plant, while the other half may be operated entirely separate.

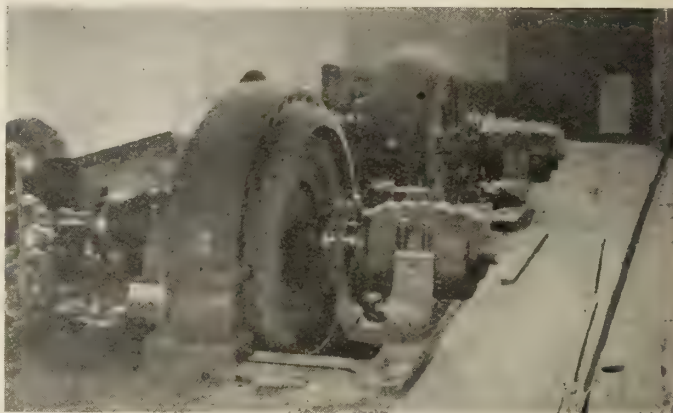
The switchboard consists of ten panels, four gener-



Switch Boards and Control Desk.

ator, two exciter, two regulator and two feeder panels. The oil switches, rheostats, and water wheel governors are controlled from a control desk, upon which is mounted a dummy bus bar showing the whole station layout at a glance. All the oil switches, rheostats and governor control motors are operated from a Westinghouse storage battery, which is mounted in a small battery room on the main floor. Two Tirrill regulators are installed for regulating the voltage, and are so connected that either regulator may be operated from either half of the plant.

The transmission line is about 30 miles long and is

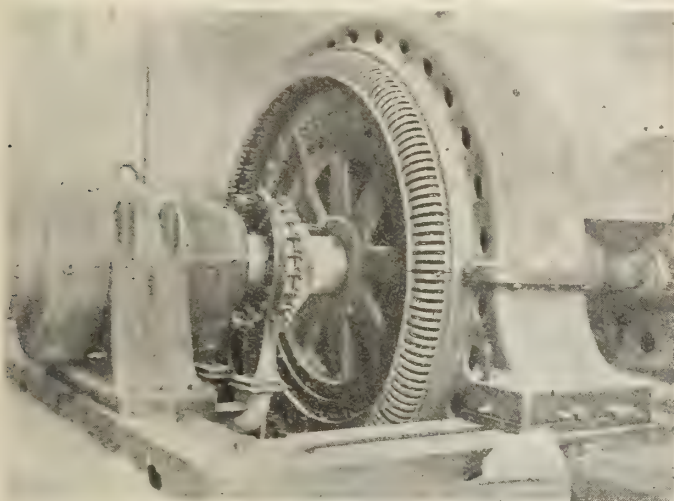


Interior of Power House, Showing Two of the Machines.

built of cable consisting of seven strands of No. 10 hard drawn copper around a jute centre, supported on Locke porcelain insulators. The line is protected at both ends by oil cooled choke coils and low equivalent lightning arresters. At present only one line is complete, but both generating stations and substations are arranged for two lines. The line runs directly to a new concrete



substation at Cote St. Paul, about four miles outside of Montreal, in which are installed six 2500 K.W. transformers which step down from 40,000 to 12,000 volts, at which pressure it is fed into the company's system. The high tension apparatus in the substation is similar to that in the generating station with the exception that the distribution is at 12,000 volts. Eventually the substation will be used for local distribution around Cote St. Paul, and provision is made for installing the feeder switchboard, but at present it is used solely for step-

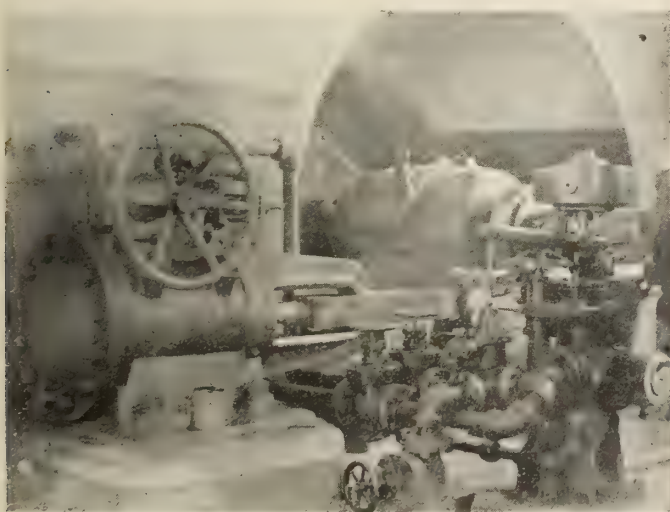


One of the 3750 K. W. Generators.

ping down from 40,000 to 12,000 volts to feed into the company's large central substation.

The water wheels and governors in the generating station were built and installed by the Allis-Chalmers-Bullock Company, and all the electrical machinery, from the water wheel couplings to the high tension outlets, was built and installed by the Westinghouse Electric & Manufacturing Company, who also supplied the transformers at the substation. Mr. A. Gilmour had charge of the Allis-Chalmers work and Mr. S. W. Brown installed the apparatus for the Westinghouse Company.

The work of digging the canal and building the dam



The Allis-Chalmers Governor.

and power house was started in June, 1906, by the Canadian White Company, who had the contract for this work. It was completed about the middle of January, 1908, with the exception of cutting the final strip con-

necting the canal with the main Soulanges canal, which was completed about the 15th of November.

The generator room of the power house is 158x31 feet, and there are seven transformer cells 10 x 11 feet 6 inches along one side of the main floor, also a small battery room 10 x 12 feet 6 inches. The switchboard is situated in the centre of the building and a wing is built at the back to make room for the concrete bus bar structure. This wing extends up three stories, the first one containing the generator field rheostats, local feeder switches and part of the low tension bus bar structure, the second one contains the 44,000 volt tie switch for connecting the two halves of the plant, and the third storey contains the 44,000 volt line switches, high tension bus bars, lightning arresters and choke coils.

The plant started supplying power to Montreal on Nov. 9th with one 3750 K.W. unit, and since then has been steadily in operation. The second unit was started on Nov. 30th, and the third one in the middle of December.

### Canadian Electrical Association

The vote of the membership of the Canadian Electrical Association on the meeting place for the next annual convention shows the choice to be between Quebec, Ottawa and Niagara Falls. A meeting of the Managing Committee will likely be held this month, when the matter will be decided. It is expected that at the next convention interesting and valuable reports will be presented by the various committees, the personnel of which is as follows:

Committee on Theft of Current—Messrs. W. J. Robertson, Montreal (Chairman); R. G. Black, Toronto, and H. O. Fisk, Peterboro.

Committee on Statistics—Messrs. W. A. Bucke, Toronto (Chairman); John Murphy, Ottawa, and W. L. Adams, Niagara Falls.

Committee on Grounding of Transformer Secondaries—Messrs. R. S. Kelsch, Montreal (Chairman); J. G. Glassco, Hamilton, and W. G. Chace, Winnipeg.

Committee on Meter Inspection and Testing—Messrs. A. A. Dion, Ottawa (Chairman); R. S. Kelsch, Montreal; J. M. Robertson, Montreal; J. J. Wright, Toronto, and A. A. Wright, Renfrew.

It is most desirable that the members of the association should co-operate with the committees and assist their work as far as possible. Particularly is this necessary in respect to statistics, the value of which will depend very largely on the extent to which the committee receives the co-operation of the operating companies.

### The Metal Markets

The price of copper is steady with an easier tendency. The scarcity of sales has not had much effect upon producers. Conditions, however, are in favor of lower prices, as recent United States production has been the heaviest in the history of the country, whereas the consumption is only about 75 per cent. of normal. New York prices are: Lake, \$14.25 to \$14.37½. Aluminum prices have continued on the decline. Prices in Europe and America are now about the lowest they have ever been. It is ranging in Europe between 14½ and 16 cents for ingots in ton lots. In the United States it brings between 22 and 24 cents. It is not thought improbable that it may fall still lower in price. Aluminum at 20 cents per pound is equivalent in conductivity to copper at 10 cents. The open competition in aluminum production is likely to make a great increase in its use for electrical purposes.



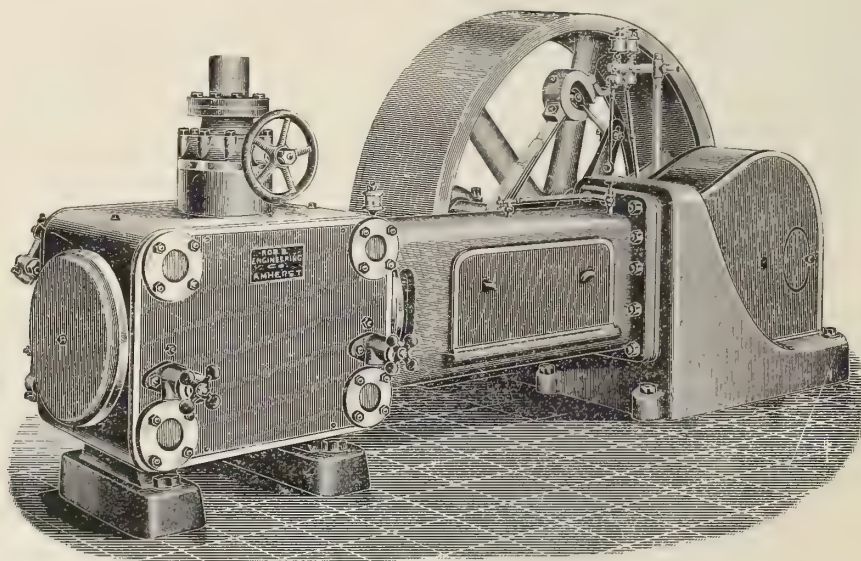
# A Comparison of Two Types of Valve Engines

Data obtained on Slide Valve Tandem Compound, and Simple Corliss Valve Engines.

A comparative test of a Robb-Armstrong slide valve tandem compound engine and a simple Corliss valve engine was recently made by two students of Stevens' Institute of Technology, Hoboken, N.J., which brings out a number of interesting facts. A description of the test was written for a thesis—required of each member of the senior class before graduation. The thesis prepared was as follows:

The plant where the data included herein was obtained gives light and power to the town of Amherst, Nova Scotia, Canada. The power house contains two tandem compound engines and a simple Corliss engine, each driving by belt two direct-current generators. These

caused to open and close quickly and remain stationary during the remainder of the stroke by the introduction of two small links between the wrist plate and each of the bell cranks, the action being almost precisely the same as with the releasing gear ordinarily used on a Corliss engine. The steam valves are driven positively by shaft gear, which controls the shut-off, in a similar manner to all shaft governed engines; the time of admission of steam is varied slightly so that the lead is negative, and the admission line lowered for light loads, and early cut-off, which probably gives higher economy of steam consumption, as explained in the Transactions of A.S.M.E., volume 18, page 1063. The exhaust valves



Robb-Armstrong Corliss Engine—Type "F."

engines are non-condensing and exhaust through one feed water heater. As we wished only to compare the two large engines, we excluded the small tandem engine from the test by exhausting it directly to the atmosphere.

For brevity we will call the unit composed of the slide valve engine and generators "S," and that of the Corliss valve engine "C." The size and rating of engines "S" and "C" are as follows:

Engine "S."	Engine "C."
Bore, 14 and 22-inch.	Bore, 15-inch.
Stroke, 20-inch.	Stroke, 24-inch.
R. P. M., 170.	R. P. M., 165.
Boiler pressure, 120.	Boiler pressure, 120.
Rated horse power, 220.	Rated horse power, 225

The steam valves of engine "S" are of the Sweet, or straight line type, balanced against the steam pressure by a heavy stationary pressure plate, held away from the valve seat by distance strips, allowing the valve to move freely between the seat and the pressure plate. The automatic cut-off is obtained by means of the Robb-Armstrong-Sweet shaft governor, located in the driving wheel of the engine, so arranged that the cut-off of the valves is controlled directly by the action of the governor.

Engine "C" is fitted with the Armstrong-Corliss valve gear, constructed as follows: The steam valves are

are driven by fixed eccentrics and wrist plate geared in the ordinary way.

The size and rating of generators of units "S" and "C" are as follows:

Generators "S."	Generators "C."
No load, volts, 115.	No load, volts, 115.
Full load, volts, 125.	Full load, volts, 125.
Full load, amperes, 440.	Full load, amperes, 600.
R. P. M., 925.	R. P. M., 850.

The generators are connected in series, and deliver current on the three wire system.

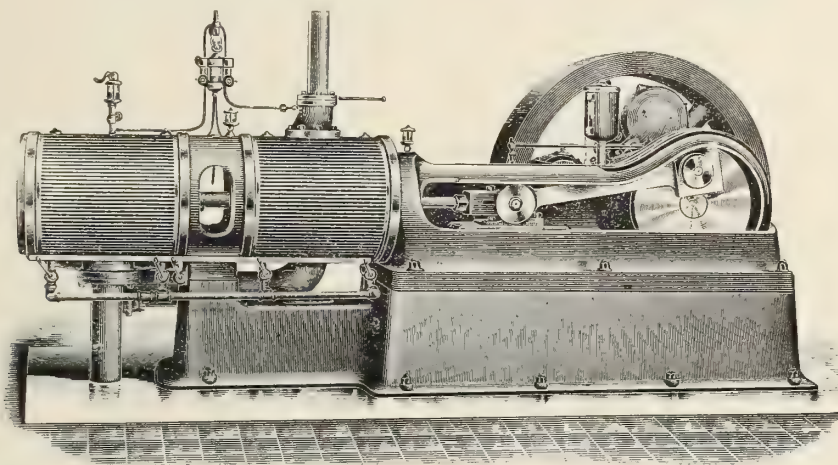
The electrical power was absorbed by a water rheostat improvised for the occasion, which consisted of the end of an old boiler drum, three feet in diameter, and five feet high. The neutral wire was connected to the by shaft gear, which controls the shut-off, in a similar nect each to a sheet of boiler plate arranged so as to slide vertically in wooden guides. Each plate was tapered to a point at the lower edge, so that it was possible to draw just the current required for the various loads. The rheostat was placed out of doors, and the severe cold weather aided in keeping the water from evaporating too rapidly.

The condensers used in the test consisted of feed water heaters. Each heater was composed of a vertical



cast iron shell. The exhaust steam entered one side near the bottom, passed up to the top, over a baffle plate, down and out the other side. In passing it surrounded a number of brass tubes containing in the ordinary use feed water, but in our case the water ran through, and to waste. We used two 500 horse-power heaters in conjunction with the old heater, and piped them up in such a way that the condensed steam could be drained to tube placed on scales, and weighed. The final exhaust outlet of this line of condensers was left open, so that the engines would be exhausting at atmospheric pressure. The switchboard instruments were then calibrated by comparing them with standard instruments borrowed from Stevens' Institute. The indicators were cleaned, tested, oiled and lined up. The pressure plates and valves scraped true, also pistons examined, and the tandem was ready for the test.

We carried loads on the engine, commencing with full load, then three-quarters, one-half, one-quarter and zero, as near as we could approximate from the electrical readings. We found it impossible to carry an overload on the engine as the generators were too light, and we would also run off the scale of the switchboard instruments. Each load was carried for one hour, indi-



Robb-Armstrong Slide Valve Tandem Compound Engine—Type "D."

cator cards, and readings being taken every ten minutes. The total weight of water for each load was recorded. In the test of the Corliss engine the same general mode of procedure was followed.

The results of these tests were tabulated on blue prints, showing a comparison of the efficiencies, steam consumption and general economical workings of the two engines.

A comparison of the two tables shows better results for the Corliss engine. The steam consumption per hour per horse-power for engine "S" runs from 60 lbs. at zero load to 27.85 lbs. at full load, this evidently being the load for highest economy. The table of steam consumption of engine "C" shows a decrease from 44.7 lbs. per hour per horse-power for zero load to 26.1 lbs. per hour per horse-power for three-quarters load, and then a slight increase to 26.8 for quarter overload. The nexted each to a sheet of boiler plate arranged so as to 85.97 at full load to 83.72 at quarter overload and 54.6 at quarter load. The slide valve efficiencies run from 78.6 at full load to 48.9 at one-quarter load.

The students making this test were indebted to the Canada Electric Company for the use of their plant, and also to the Robb Engineering Company, Limited, for apparatus used and necessary help.

## Stray Currents in Winnipeg

F. A. Cambridge, city electrician of Winnipeg, has written the following letter to the civic fire, water and light committee:

"In the course of investigating the cause of a recent fire in the McIntyre Block, I find that a very dangerous condition exists, due to the presence of stray electric railway currents. This current is coming into the building on the gas and water services and is flowing from them to the leaden covered cable of the Government telephone system and over them to the Mill street sub-station of the Winnipeg Electric Railway Company. An inspection reveals one place where the lead covering of the cable is burned almost through at the point where it touches an iron pipe. Voltmeter readings show that the steam, gas and water pipes are each three volts positive to the lead cables and on placing an ampere meter between the gas or water pipes and the cables as much as ten amperes is shown to be passing. This does not indicate the true actual amount that may pass, as the different pipes are making contact with one another at numerous points. The actual current may be much greater.

"I am satisfied that the above conditions were quite sufficient to cause the fire, and beg to point out that all buildings having lead-covered telephone cables are exposed to similar danger.

"As I have on previous occasions pointed out, the only way in which the danger can be removed is in the rebonding of the centre street railway system, excepting portions of the new work installed this year. Under present conditions not only are our water pipes being destroyed, but citizens' lives and property are exposed to very serious danger."

## Current Losses at Nelson, B. C.

R. A. Brown, city electrician of Nelson, B.C., reports that the city is every day losing a large amount of electrical current through subscribers using larger lamps than they are paying for. In discussing the matter Mr. Brown said that the practice appeared to be widespread. People who were paying for eight candle power lamps were using sixteen candle power lamps, and people who were paying for 16 were using 32, and so on. He had had an inspector go over the city and as a result had been able to reduce the consumption by about 50 kilowatts per day, but there was still a great difference between the amount of power being used and the amount being



# Electric Railway Department

## B. C. Electric Company Prospering

The British Columbia Electric Railway Company recently announced that the bonus to be given to the employees in accordance with the profit-sharing scheme instituted in 1902, will be \$66.78 for each employee. This will involve a distribution of about \$45,000. The amount divided among the men is one-third of the balance available for dividend after four per cent. has been paid on the common stock of the company. The payments for 1908 show an increase over the amount received in any previous year. The previous payments to each employee were as follows: 1903, \$25; 1904, \$35; 1905, \$40; 1906, \$45; 1907, \$63. The fund is equally divided among all employees of the tram company all over its system, without regard to rank, the only proviso being that the person should have been in the service of the company from July 1 of the previous year to the date of distribution.

## Automatic Signal Installation at Toronto

An interesting installation of an automatic railway signal is being made upon the Toronto & York Radial Railway Company's Mimico system by the Simmon Automatic Signal Company. The general plan of the signal scheme is to divide the road into blocks, their length depending upon the condition of the road, and connecting each block by an electric circuit with the despatcher's office. An automatic record of train movements in the despatcher's office is made in graphic form on a record sheet moved uniformly by clockwork. Upon any train entering a block an electrical change is brought about in the despatcher's office which influences a relay in the despatcher's office, thus making a record on the recording sheet.

The signal end of the system consists of a cab signal on the car or locomotive consisting of a green light for "safe," and a red light and bell for "danger." Intermittent third rails approximately forty feet in length are erected at the beginning of each block and also at a point a suitable distance back from the beginning of the block and being known as a "distant rail." A shoe on the car or locomotive makes contact with this third rail. When a car in passing a "distant rail" receives energy from the despatcher's office through the third rail a "clear" signal is displayed. If a despatcher, however, deprives this particular third rail of energy a "danger" signal is displayed on the locomotive. It is further possible to display a danger signal automatically without any action on the part of the despatcher by passing the circuit leading to the despatcher's office through a track relay or through a switch box and with this arrangement a train in the block ahead or a broken rail or an open switch will automatically give the danger signal to a following or approaching train without the assistance of a despatcher. Upon a train receiving the danger signal at a distant rail, which it may obtain at full speed, the engineer gradually reduces his speed and comes to a full stop over the home rail which is located just at the beginning of a new block. When stopping over such a third rail an electric circuit is established through the shoe on the locomotive and the third rail with the despatcher's office, enabling him and the engineer to communicate by telephone.

Interlocking devices in the despatcher's switchboard prevent the despatcher from arbitrarily giving "clear"

signals at any one point if by reason of such signal two trains would get conflicting signals. The installation of this system upon the Toronto & York Radial Railway was commenced in October last, and it is expected that the work will be completed early in January.

The Block Signal and Train Control Board, a body of experts who investigate railway signal systems for the United States Government, have reported favorably upon this system and have decided to make an official inspection of the Toronto installation. The inspection will consist of the board spending a few days on the work and leaving an expert in charge for a period of about six months. It is expected that the system in Toronto will be ready for inspection about February next.

## Paragraphs on Traction

The Brantford, Ont., City Council have asked the Street Railway Company to put up a guarantee of \$25,000 that the present lines will be rebuilt within one year and an extension made within two years, before a renewal of the franchise will be granted. The company's rights have lapsed owing to failure to make the promised improvements within the time stipulated in the agreement a year ago.

The matter of cartage of city freight by the Montreal Street Railway was taken up at a meeting of the Montreal executive of the Canadian Manufacturers' Association recently. Some time ago the association placed itself on record as favoring this proposition, provided the regular passenger service was not in any way interfered with, and that the matter of revenue to the city was not disturbed. The question was referred to a special committee.

The British Columbia Electric Railway Company have now inaugurated an electric lighting service in Chilliwack, the current being supplied by a temporary plant which will continue in service until the Chilliwack tram line is completed. Fifty street lights are being operated and current is being supplied to many private residences. As the result of a dispute regarding occupancy of streets in the business section of the city, by the poles of the company, that district is not yet enabled to obtain the benefits of the service.

At a recent meeting in Ottawa it was decided to make application to the Provincial Government for a charter for an electric belt line to run from Ottawa to Morrisburg, westward from Morrisburg to Brockville, north from Brockville to Darling, there to meet the North Lanark steam railway now in course of construction from Ottawa to Darling. Eastward from Morrisburg, it is proposed that the line should run to the south-eastern corner of the boundary between Ontario and Quebec, whence it may later be continued to Montreal. The line, omitting the branch from Morrisburg east, will cover 143 miles—50 from Ottawa to Morrisburg, 33 from Morrisburg to Brockville, and 60 from Brockville to Darling. The cost, it is estimated, would be \$14,000 per mile, or \$2,002,000 for the line. Operation would cost \$1,500 per mile, or \$214,500 per year, and the earnings are estimated at \$2,500 per mile, or \$357,500 per year.

The Lorne Power Company, Limited, Victoria Mines, Ont., has been incorporated with a capital of \$300,000.



### Small Defects in Cars are Important

Any car is liable to dangerous defects that normally should be detected in the course of the car house inspection. Unfortunately, this cannot always be done, especially with regard to apparently trivial but really serious irregularities overlooked by the conductor and motorman. For example: loose, bent or broken grab handles; weak or broken pole straps; broken, splintered or badly spliced strap poles; steps loose or bent; raised, broken or missing floor mats or strips; broken window glass, with jagged edges; bent draw bars or hangers; open car step worn below the surface of its iron guard, thereby leaving a sharp edge to catch the shoe of an alighting passenger; a dozen other small irregularities easily and quickly rectified. On a new style of drop sash, unfamiliar to the average rider, who wishes to open a window, people get their knuckles cut owing to the absence of any positive means for holding the sash over the runway just before dropping it. If two enthusiasts work together somebody is likely to be hurt, because the natural tendency of pressure on the top is to force the sash to its back position, and when it comes down one man may have his fingers between the bottom and the sharp edge of the hinged cap. There should be some strictly enforced rule whereby the existence of such defects will be brought to the attention of the proper official.

### The Faults and Advantages of Steel Ties

Steel ties are being adopted by a number of street railway companies for track construction in paved streets, but the rapidly waning supply of wooden ties and their increasing cost have not yet proved sufficiently alarming to most engineers to warrant the use of steel ties in open ballasted track, says the "Electric Railway Journal." Steel ties cost from two and one-half to three times as much as wooden ties at present prices of 75 cents for the latter and from \$1.75 to \$2.50 for the former. The life of steel ties, on the other hand, is estimated at from 20 to 30 years in open track and an indefinitely long period when encased in concrete in paved track, whereas wooden ties even when treated at an additional cost of from 10 to 50 cents per tie will not last more than 18 years at the most, and generally begin to fail after from 7 to 10 years. The relative economy of steel and wooden ties, considering interest on investment, maintenance cost, first cost and scrap value can be reduced to a simple equation showing the maximum first cost of wooden ties and the minimum first cost of steel ties for equal economy. Roughly speaking, at present market prices of steel ties they show no economy in ballasted track over wooden ties costing less than \$1 a piece.

In track with concrete foundation, however, the first cost per foot of track of steel tie construction is less than that with wooden ties for the reason that the spacing of ties can be doubled and a smaller quantity of excavation and concrete is required. Charles E. Clark estimates that a saving in first cost of \$1,637 per mile of track can be made by using steel ties instead of wooden ties and there can be no question of the longer life of the all-metal construction. Inasmuch as Mr. Clark was one of the earliest advocates of this form of construction and has had extended experience with it, his figures of relative costs are of especial interest.

Two faults have been found with steel ties when used in ballasted track carrying the heavy wheel loads of steam railways. The early forms of channel trough ties proved too weak to carry the vertical loads imposed, and failed quickly when put in track. Later forms of

I-beam section, on the other hand, have been criticized as being too rigid, causing the rails to break instead of the ties. Track in paved streets cannot be too rigid, so that this objection does not hold. The other defect, if it may be called a defect, is not in the tie itself, but in the form of rail fastening employed. In ballasted track, bolted clip fastenings sometimes work loose, and are liable to be sheared off by the flanges of derailed wheels. When the ties and the base of the rail are completely embedded in concrete and protected by the paving above, this objection to the fastenings is also overcome.

### Ontario Auditing System is Good

The members of the Ontario Railway and Municipal Board attended the recent convention of the Canadian Street Railway Association. They were particularly interested in the question of the standardization of accounting and returns required under the Railway Act from Canadian street railway companies. Mr. J. Paine, who has charge of the Canadian railway statistics, addressed the convention on the subject. He visited Washington a short time ago and decided to join in Canada the movement for uniformity in accounting and returns inaugurated by the Inter-State Commerce Commission of the United States. The Ontario Railway and Municipal Board will aid the movement as far as the roads under its jurisdiction are concerned. Mr. Jos. Leitch, K.C., the chairman of the Board, said that little or no change would be necessary in the returns now required in Ontario. As a matter of fact, it is said that the reports demanded by the Ontario Railway and Municipal Board are far in advance of any made elsewhere in Canada or in the United States.

### Montreal Railway's Annual Report

The annual report of the Montreal Street Railway Company for the fiscal year ended September 30, 1908, submitted at the 48th annual meeting, held recently, shows the following: Gross receipts, \$3,677,432; operating expenses, \$2,158,394; net earnings, \$1,519,038; interest from Montreal Park & Island Railway Company, \$72,011; total income, \$1,591,049. From this are deducted: City's per cent. on earnings, \$242,431; interest on bonds and loans, \$207,187; rental leased lines, \$5,019; leaving a net income of \$1,136,411; after deducting 10 per cent. dividend, \$900,724, surplus is \$235,686. From surplus the following amounts have been appropriated: Contingent account, \$175,000; fire insurance fund, \$25,000; leaving \$35,686, which has been transferred to general surplus.

Peterborough, Ont., is taking an interest in municipal power, and, it is understood, may soon approach the Hydro-Electric Power Commission. One plan suggested is to obtain the power from sources about 20 miles north of the city, following the same plan that has been followed at Ottawa. If this should not prove feasible, the civic authorities may ask the commission to bring Niagara power to the city. The demand is estimated at 8,000 horse-power.

The B. C. Electric Railway Company have made a voluntary reduction in the price of lighting in Vancouver and on the whole of the mainland touched by the company's wires. In the city of Vancouver an extra ten per cent. discount has been given, making a total of 20 per cent.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Question No. 1.—When answering question No. 1 last month you referred to T and V transformer connections, please tell me what they are?

Answer.—The "T" connection is simply the wiring used when transforming from two-phase to three-phase, or vice versa, that transformer which has one end of its winding connected to the middle of the other being said to be connected in "T" to it. The name comes from the resemblance of the diagram of connections to the letter T. It is simply an alternative to the name of "Scott connection," named after Mr. Scott, of the Westinghouse Company, who was the first to employ it as a very simple means of transformer from three-phase to two-phase, or vice versa. The "V" connection is simply the ordinary delta arrangement except that one transformer is left out, hence it is also frequently known as the open delta. The name comes from the fact that if you take one side out of the ordinary diamond or three-cornered diagram universally used to indicate a delta connection, you have a V-shaped figure left.

Question No. 2.—Is it easier to run low frequency alternators in parallel than if they are high frequency, and does the number of phases make any difference?

Answer.—Satisfactory parallel operation means running without cross currents between the two machines, or at least without these currents becoming large enough to have any appreciable effect on the heating of the machines. These cross currents depend upon or are produced by the angular variation of the position of the armature from that which it would occupy were its rotation absolutely uniform, this variation usually being expressed as a percentage of the angle between any pair of poles. Obviously the fewer the number of poles the greater the angle between any pair, with a corresponding increase in the permissible variation of the position of the armature. As low frequency machines generally have fewer poles than those of high frequency, it follows that the former may depart more from absolutely uniform rotation and still not produce bad cross currents, or conversely, that the same angular variation in both will produce smaller cross-currents in the low than in the high frequency machine. This means that the tendency is, other things being equal, for low frequencies to give somewhat easier parallel operation than the others. As against this it must be remembered that high frequency generators are usually driven by water wheels or by high speed engines, both of which are prime movers that tend to give much more uniform rotation than that produced by the slow speed engines so frequently found on low frequency generators. This, of course, tends to good parallel operation, and in practice might easily outweigh the above disadvantage.

We do not know that the number of phases makes

any material difference to parallel working. Perhaps some of our readers might like to give some information on this point.

Question No. 3.—What is the general method in Canada of selling electric energy for light and power purposes, especially for lighting purposes? Is it by meter or by flat rate? I am told that several of the large companies have adopted the meter rate?

Answer.—We would say that almost every city in Canada is selling light by the meter rate, to the almost entire exclusion of the flat rate system. Perhaps Hamilton is the largest and, in fact, the only city of any size that has flat rate lighting contracts of any size, and we understand that they are being wiped out as fast as they expire. The same conditions are true of most, if not nearly all, of the larger towns, so that to-day the flat rate system of charging for lighting is seldom found outside of the smaller plants, and then only when driven by water. Meters are not used to nearly the same extent on power work, due probably for one thing to their greater cost, as compared with a lighting meter, but they are gradually becoming more common. It should be noted, in this connection, that flat rate systems, or even flat rate controllers, are decidedly wrong and inferior to a meter system for this one reason, even if there were nothing else to be said against them, namely, that they are a prohibition to the consumer, holding him down to a certain specified consumption, whereas the only proper policy is that, possible only through the use of a meter, which says to the customer, go ahead and use all you can.

Question No. 4.—When testing a polyphase meter, is it best to calibrate each side separately, or should you connect the current coils in series and calibrate them together. If you test the two sides separately, is there any need to have both potential coils excited?

Answer.—As long as the meter is to operate on a balanced polyphase load it does not make very much difference which way you calibrate, but if the load is to be badly unbalanced, or if it at any time might be single-phase, you should really calibrate each side separately. If you do not, you have no guarantee as to the accuracy of each side, but only as to the meter as a whole; in other words, you have no means of telling whether or no you have not got such a condition as 5% fast on one side and 5% slow on the other. This on a balanced polyphase load might produce you a correct reading, but obviously a single phase load could not be registered properly.

You need to excite both potential circuits no matter whether you test with both current coils in circuit or not. The reason for this is that each potential circuit has an effect on the operation of the meter, particularly at light loads, and as it will be operating with both circuits excited, it should also be calibrated that way.

The Canadian Westinghouse Company, Limited, have issued an attractive little pocket diary, handsomely bound in light brown leather and containing much useful information for electricians and engineers. It has a liberal supply of space for diary purposes and contains some useful maps of Canada. The diaries will be welcomed by those who are fortunate enough to receive a copy.

A proposal is under consideration by the Montreal City Council for the purchase of the plant of the Montreal Water & Power Company.



## Lighting from a Concealed Source

To light a room by some plan in which the source of light is concealed, is generally acknowledged to be the most comfortable and successful method. The initial expense and cost of maintenance have heretofore prevented its adoption for general use. The development work done by the National X-Ray Reflector Company during the past year and the advent of the tungsten lamp have resulted in making indirect illumination commercially available.

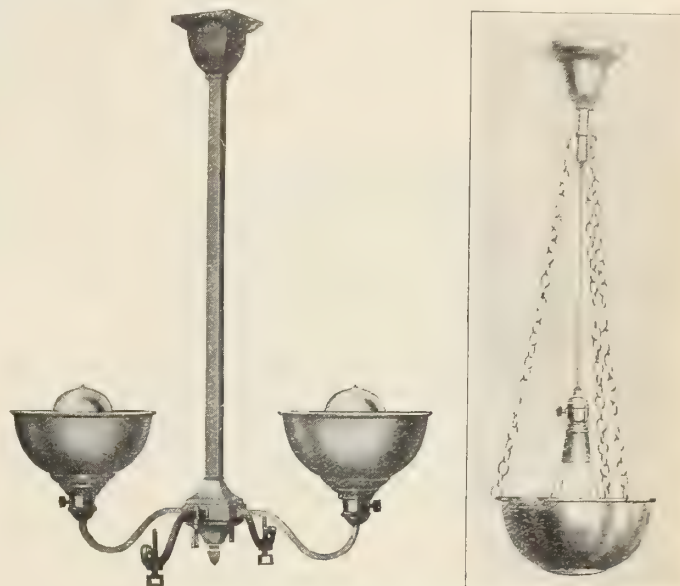
In their "I-Comfort" (eye-comfort) system they combine with the highly efficient 60 and 100-watt tungsten lamp, or with upright, high grade, gas mantle burners, a specially designed one-piece glass X-ray reflector with spiral and vertical corrugations, plated with pure silver, giving a perfect reflecting surface. This reflects the light to the ceiling with the highest efficiency possible. The diffused light reflected from the ceiling gives surprising results and is a source of much comfort to the eye.

The spiral and vertical corrugations eliminate lines and shadows on the ceiling. The silver is covered with several coats of elastic enamel, which will not craze or crack. It expands and contracts with the glass under varying changes of temperature and thoroughly protects the silver coating, making it impossible for the reflecting surface to tarnish or grow dim. The exposed part of the reflector is fire polished, making it durable and easily cleaned.

The company claim that this system is nearer to daylight than any other artificial system. It follows the recommendation of prominent oculists in that the source of light is concealed. An important advantage is that

illuminate sufficiently for all ordinary purposes a room 15x15 feet.

The cost of maintenance, it is claimed, is no greater than with ordinary installations and in many instances much less. For instance, the room 12x14 feet, shown in figure 1, with light colored walls is beautifully illuminated with one 60-watt tungsten lamp, the consumption of current about equalling that of one 16 C.P. ordinary car-



Types of "I-Comfort" Fixtures.

bon filament lamp, while the illumination is ample for the purpose and more comfortable to the eye than afforded by the previous method of lighting by two exposed 16 C.P. lamps. This is a saving of one-half. Should a room of this size be used for very close work, or have dark walls, a 100-watt lamp (with a smaller current consumption than with two 16 C.P. carbon filament lamps) would be found sufficient.

The units are subject to an infinite variety of adaptation, from the inexpensive one-unit fixture, which can be placed on a gas or electric fixture already installed, to those especially designed, either simple or elaborate, according to the space to be illuminated and the amount which the user is willing to pay for lighting fixtures.

## A Striking Novelty in Arc Lamps

A novelty in lighting fixtures is being exhibited by the Midland Electric Company, Limited, in the shape of a handsome polished brass arc lamp, decorated in the Empire style. The interior contains nine sockets to hold Kolloid-Wolfram lamps, and over the lamps is a large opaline bowl. The effect when lighted is striking. The opaline dome imparts a soothing rich white light.

Mr. Woolf, of this company, has recently returned from the Maritime Provinces, where he reports business to be excellent. Mr. Frank Goodwyn, of the same firm, left recently for Vienna in order to make contracts for the entire output of the Kolloid-Wolfram lamp factory for Canada. It is interesting to note that the Midland Electric Company have recently increased their capital in order to be able to handle their increasing business. Their head office is at 119-121 Youville Square, Montreal. The president is Mr. J. A. Jacobs, well known through his Cobalt connection, and the other officers are: Mr. A. M. Reaper, secretary-treasurer; Frank Goodwyn, vice-president and managing director, and A. L. Woolf, one of the partners of the former firm, who is on the board of directors.



Room Lighted by "I-Comfort" Fixture.

the use of drop cords can be dispensed with in offices. The absence of heavy shadows is a feature also which will commend the system greatly. Assuming that the ceiling is light and the walls are medium, as is usually the case, one 100-watt tungsten lamp will be sufficient for a room 12x13 feet with desks on all sides and no desk lamps. For smaller private offices a 60-watt lamp will frequently be sufficient. Where a gas unit is used an upright burner and mantle of high-grade are required. One mantle burner with an "I-Comfort" unit will il-



## A New Type of Gas Engine

The Goldie & McCulloch Company, Limited, of Galt, Ont., have recently acquired the Canadian rights to the gas engine patents of Mr. L. F. Burger, of Beloit, Wis., and have designed a type of engine embodying the essential features of these patents. This company is widely known as builders of high grade steam engines, and this class of work is evident in their gas engine design. The poor mechanical features so noticeable in most gas engines are not present.

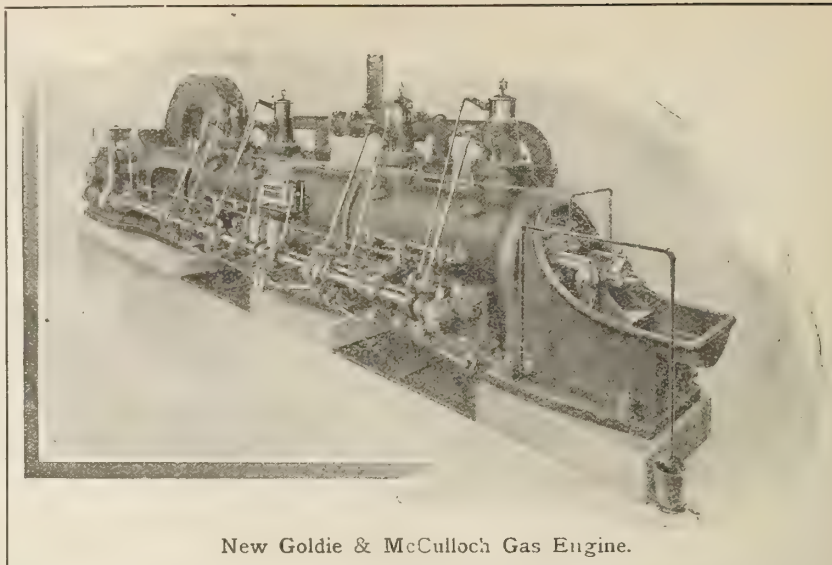
The cylinders, frame, crosshead, connecting rod and shaft have been built with a thorough knowledge of the strength of the various materials and the strains they are called on to stand, and at the same time, easy accessibility of parts is accomplished. The special valve gear and governing devices are the result of many years' experience on the part of the inventor, and this, combined with the mechanical and engineering experience of the Goldie & McCulloch Company, have produced an engine which is in marked contrast to most engines now on the market.

As will be seen from the illustration, this is a two-cylinder tandem double-acting engine—a type now generally adopted for high power engines, as it has the advantage of obtaining power from four cylinder ends without any increase in the size of frame, shaft or pins and at the same time gives two impulses every revolution, a condition necessary to successfully run direct connected alternating current electrical generators in parallel without the use of the enormous fly-wheels which are compulsory with single-acting engines.

The valve gear, one of the most important features of the engine, is the method of admitting the gas and governing the quantity. The governing is done by admitting suitable quantities of a constant mixture. This mixture is admitted through an auxiliary valve, whose time of opening is controlled by the governor. The valve is placed directly over the main inlet valve. The main inlet valve opens slightly before the piston reaches the end of its stroke and admits free air to the cylinder producing a scavenging effect. The auxiliary inlet valve is afterwards opened where determined by the governor, and closes at the end of the stroke. Variable quantity with constant compression is thereby obtained. The governor used is the celebrated "Rites Inertia Governor," which is particularly adapted to taking care of sudden changes of load with minimum change in speed.

The main inlet and exhaust valves are of the mushroom type with removable seats in water-cooled cages. The main valves are operated from a cam shaft fitted with cams engaging with rollers on the ends of the valve rod levers. These cams and rollers are designed to give accurate timing to the valves and have large wearing surfaces. The auxiliary valves are operated from a supplementary cam shaft running parallel to the main cam shaft and connected to it and the governor through a "floating" gear arrangement.

The pistons and rods.—These are water cooled and are supported by the main crosshead and also intermediate and tail crossheads, thus keeping the weight of the pistons off the bottom of the cylinders and giving the packing and lubrication every chance to be effective. The lubrication of the pistons is effected by a positive



New Goldie & McCulloch Gas Engine.

feed oil pump which is so arranged that the drop of oil can be delivered to the interior of the cylinder at exactly the right moment.

The piston rod packing is metallic, of a design that has proved its worth on some of the largest engines built in America and is extremely simple, and if properly installed and cared for should last indefinitely.

The cylinders.—These are water jacketed and the jacket is provided with a large number of handholes, which give easy access for cleaning out should the circulating water be of such a nature as to leave a deposit. The frame connecting piece between the cylinders and the tail crosshead support are heavy castings, with the metal properly distributed to carry the strains. The peculiar design of the cylinder connecting casting, with its large opening and removable strut, gives a most convenient access to the intermediate crosshead and cylinder covers. The frame is provided with a crosshead of large diameter, which enables the front cylinder cover and piston to be removed without disturbing the crank shaft, and the crank shaft is supported by a main bearing on each side of the crank pin, thus distributing the strains evenly about the centre line of the engine and providing enough bearing surface to keep the unit pressure within safe limits for continuous service. The main bearings are provided with wedge adjustment.

The crank shaft—This is made from a solid steel forging and is very liberal in its dimensions, and besides the two main bearings, is provided with a large adjustable self-oiling outer bearing, on the fly-wheel side. The crank carries counterweights of sufficient weight to balance the engine properly.

The starting device is extremely simple and automatically admits compressed air to the two inner cylinder ends, so that these can be used to start the engine, and, when well started, gas can be admitted to the two outer ends and got under working condition, when the air can be shut off and the other two ends started firing. The igniting mechanism is of the make and break type and the timing of the spark is adjustable by hand when the engine is running. The engine is provided with two magnetos for supplying the current when the engine is up to speed, and a double set of batteries and spark coils for starting.

The water circulation is well arranged so that each part can be given just the amount of water required. Discharge funnels are provided on all outlets, so that the operator can feel the temperature of the discharge

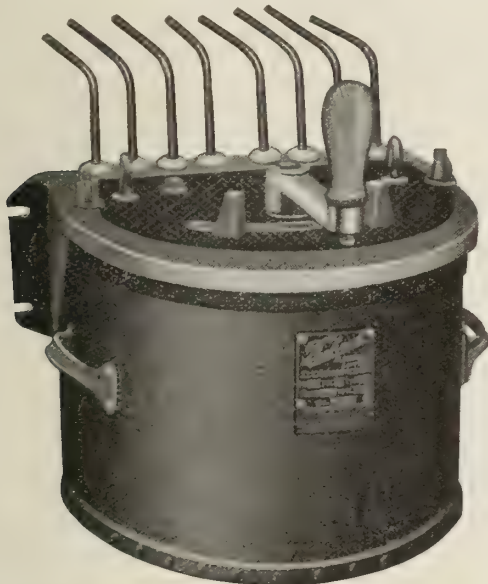


water. The engines are designed to run on natural, illuminating or producer gas. The Goldie & McCulloch Company, Limited, are prepared to furnish producers with their gas engines, which are to run on producer gas. These producers are built under Burger patents, and combine all the high-class features which are the result of the designers' long practical experience in this class of work. The generator is not provided with any grates, but the fire is built upon a bed of ashes which rests on the foundation. The ashes can be removed at any time through the water seal without opening up the generator, and this feature makes it possible to run the producer continuously without any interruption whatever.

The vaporizer is in the shape of a shallow pan placed directly over the fire at the top of the generator, and steam is admitted by a down pipe through a central tuyere casting with umbrella top. The sides of the generator lining are vertical, which allows the fire to be easily poked and eliminates any danger of "bridging." The vent valve is so arranged that when the engine is running the opening to the stack is water sealed. The scrubber is of the "wet" type, and sufficient expansion tank is provided to keep the draft approximately constant.

### Oil Immersed Auto-Starters

The Packard oil immersed auto-starters for squirrel cage induction motors, which are illustrated herewith, consist essentially of drum type double throw switches, mounted on a cast iron frame, together with two auto



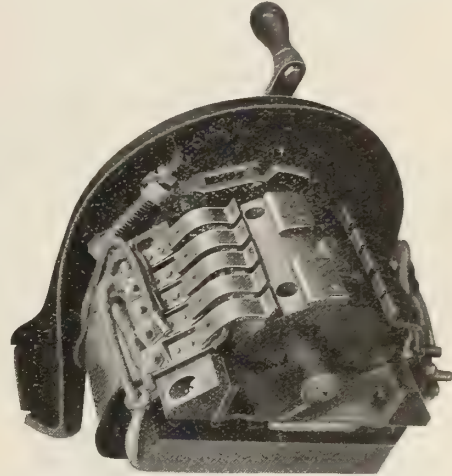
Packard Oil Immersed Auto-Starters—Outside view.

transformers, the whole being suspended in a sheet iron oil tank in such a manner that when the tank is properly filled the auto transformers and the drum type switches are completely oil immersed, thus combining the advantages of the oil switch with an oil-cooled transformer. On sizes up to and including 25 horse-power, the auto transformers are provided with four taps, allowing for starting voltages of approximately 40 per cent., 50 per cent., 65 per cent., or 85 per cent. of full line voltage; while on sizes from 30 to 50 horse-power inclusive, five taps are provided, giving approximately 40 per cent., 50 per cent., 60 per cent., 75 per cent., or 85 per cent. of line voltage at starting. The leads from the switch are brought out through sealed porcelain bushings, and

are of sufficient length to permit easy connection to the outside wiring.

These auto-starters are provided with a very simple but effective inter-locking mechanism, to prevent the operator from moving the lever to the running position before first moving it to the starting position, and this mechanism also requires that lever be moved quickly from the starting to the running position.

The apparatus has been designed with liberal starting



Packard Oil Immersed Auto-Starters—Inside view.

capacity in the transformer coils, and the mechanical construction as a whole is extremely rugged, resulting in an auto-starter which proves exceedingly satisfactory under all conditions of service.

This type of auto-starter is supplied with all Packard type "D" induction motors from  $7\frac{1}{2}$  horse-power upwards.

### A Larger Type of X Cells

Owing to the increased demand for the well-known X cells the Electrical Specialties Limited, 12-16 Shuter street, Toronto, have added a larger type to their output by making the No. 8 size, dimensions of which will be  $3\frac{1}{2} \times 8$  inches, weight  $5\frac{1}{2}$  pounds. This new cell will be especially adapted for heavy ignition work, as on stationary gas and gasoline engines, as well as on pool changers for telephones.

The No. 6 X cell will be marketed under two labels, one of them to be the No. 6 X cell telephone special to fill the demand for a battery to give lasting satisfaction in telephone service, and the other to be the X cell ignitor, which will, as the name indicates, be especially constructed to produce the reliable hot spark which is necessary for satisfactory ignition work. The orange colored label will be retained for the X cell telephone specials, while navy blue will be adopted as the color for the label of X cell ignitors.

Electrical Specialties Limited have been awarded some large contracts for 1909, and notwithstanding the usual depression which the battery business is subject to during the months of November and December they are running their factory with the same number of hands as during the month of August, when business was at its height.

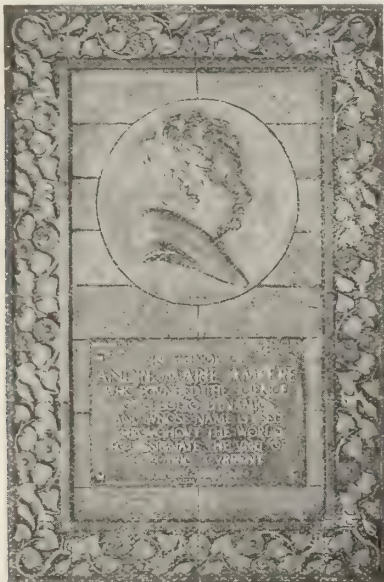
The Sunbeam Incandescent Lamp Company of Canada have moved their head offices from the Traders Bank Building, Toronto, to their new building, corner Dufferin and Liberty streets, Toronto.



## In Memory of Andre-Marie Ampere

At Ampere, N.J., on Dec. 3rd, the French Ambassador, M. Jules Jusserand, unveiled a tablet to the memory of his distinguished fellow-countryman and townsman, Andre-Marie Ampere, the famous French physicist. The tablet is the gift of Dr. S. S. Wheeler, and is placed in the new railway station at Ampere, built recently by the Delaware & Lackawanna Railroad Company. The Ambassador was received at the factory of the Crocker-Wheeler Company, which immediately adjoins the railroad station. A procession was formed under the escort of uniformed guards from the company's forces.

At the station Dr. Wheeler made an address, outlining the career and work of Ampere, and referring particularly to the adoption of his name for the unit of electrical current. At his invitation the French Ambassador unveiled the tablet, a beautiful work in bronze, of which a picture is here shown. He then made an eloquent address expressing his pleasure as a citizen of Lyons to see this memorial erected to his fellow townsman and to find that through the energy and public spirit of Dr.



Tablet to Memory of Ampere, at Ampere, N. J.

Wheeler one more beautiful city bearing the name of a Frenchman had been placed on the American map.

The tablet was received officially by Vice-President Caldwell, of the Delaware & Lackawanna Railroad. After the exercises, lunch was served in the executive offices of the Crocker-Wheeler Company.

## A New Nova Scotia Power Company

The incorporation of the Micmac Electric Company, Limited, of Bridgewater, N.S., will soon be announced. The company will be capitalized at \$300,000, with a bond issue of \$100,000. This company will develop a water power on the Port Medway River, from which they will run a twelve mile transmission line to the Leipsigate mining district, for the purpose of supplying the Micmac and other mines with power. The plant will consist of about a 300 K.W. 3-phase generator, either direct connected or belted to a water turbine of between 550 and 600 horse-power, operating under a head of 15 feet. The flume from the dam to the water wheel will be about 160 feet long, and will probably be constructed of wood and built square. The head being so low, the flume will

necessarily have to be of enormous dimensions to develop the required horse-power. The current will be used for driving hoists, compressors, pumps and other mine machinery.

The company are also figuring on operating an electric road for passenger and freight service. This road would be about 32 miles long, with the principal power station situated upon the line of road, and about equal distances from the two terminals.

Phil. H. Moore, who has been promoting the company, is president and is also acting in the capacity of consulting engineer. Thos. Hilliard, manager for the Canadian General Electric Company at Halifax, is vice-president, and F. W. Clark, of Bridgewater, is the secretary-treasurer.

## Hydraulic Development at Winnipeg

In 1906 the city of Winnipeg called upon the Board of Engineers for a report as to the available hydraulic power sites upon the Winnipeg River. On the advice received from the board, Messrs. Wm. Kennedy, Jr., of Montreal, Que.; Col. H. N. Ruttan, of Winnipeg, Man., and C. B. Smith, of Toronto, Ont., who reported on April 25th of that year, the city determined to proceed with the development of what was then known as the 30-foot falls, at a distance of 75 miles.

Complete designs for the power plant, transmission lines and terminal station were prepared under the superintendence of Mr. Cecil B. Smith, and throughout the past two seasons the construction of 25 miles of tramway has been proceeded with and is now completed. The power construction department of the city under contract, is now engaged in the excavation of earth upon the site of the works and tenders were called, returnable on December 28th, for the rock excavation, for the construction of concrete and other dams and for the power house building, all at Point du Bois, Manitoba. Tenders were also received for the supply of steel towers and transmission cable and for the erection of the transmission line between Point du Bois and Winnipeg. It is anticipated that these works will be proceeded with rapidly, and that at an early date the city will be supplied with its own electric power.

The ultimate capacity of the works will be 60,000 horse-power, under a head of 45 feet of water, and the installation at present to be made will have a capacity of 20,000 horse-power. The consulting board of engineers consists of Messrs. Col. H. N. Ruttan, chairman; William Kennedy, Jr., and Prof. L. A. Herdt. The construction will be carried on under Messrs. Smith, Kerry & Chace, of Toronto, Ont., as engineers in charge. It is estimated that about \$2,500,000 will be spent upon this work.

The National Brake & Electric Company, Milwaukee, U.S.A., have issued a booklet describing their "Air Compressors for Industrial Service." It is well illustrated and gives one a fair idea of the good qualities possessed by the company's products. The booklet also contains a number of statistics relating to the dimensions, capacity and other data of their compressors.

The Hill Clutch Company, Cleveland, Ohio, have issued catalogue "G," relating to their friction clutches. A useful description of these devices is given, together with a number of attractive illustrations and a detailed price list of their friction clutch pulley. A quantity of other useful information relating to their products is also given, making the catalogue very useful and complete.



## Two Questions for Readers

To the Editor of the Canadian Electrical News:—

Dear Sir,—There are two things to which I would like to call the attention of all those interested in electrical matters, particularly those who have charge of the operation of electric light and power plants. These two points are as follows, namely, that a great number of plants, all round this district at least, if not throughout Canada, continue to operate with ungrounded secondaries; and, secondly, that a lot of plants are using metallic cable or chain for the suspension of arc lamps, which are almost invariably attached to a circuit of fairly high voltage.

It seems to me, from what I have heard about accidents happening from secondaries getting charged with dangerous voltages, due to a cross with a primary wire or a breakdown in a transformer, that it will not be long before judges and juries will take the stand that an ungrounded secondary constitutes negligence, and that practically no defence can be organized which will be worth the trouble, to say nothing of the expense, of bringing it forward. If this turns out to be a correct forecast of the trend of events it means that all such accident cases will undoubtedly produce heavy verdicts against the electric light company. Further, as the use of electric light and power becomes more and more general, the number of accidents will undoubtedly greatly increase.

Then, about hanging arc lamps, it seems to me that anybody who uses a metal suspension, instead of rope, is simply inviting trouble to come right at him. The great majority of arc lamps, notwithstanding that a good connection with the circuit will almost certainly prove fatal, are hung with a very poor insulator between the lamp and the rope. Some, of course, are well equipped in this respect, but even the best insulator will sometimes break down, besides which the suspension may very easily get crossed with the line, especially as the latter usually has two long swinging loops in it at every lamp, free to blow against the suspension with every extra puff of wind. Obviously, if metal be used at this point it simply brings the line potential down near the ground, where almost anybody can reach it.

I would like to hear from other of your readers about these points, as to what they think of such matters, and what construction they are using. As far as I can see there is only one proper way, but still the very great majority of plants are not following it. Any information which can be given me will be greatly appreciated, particularly anything in the shape of good reasons for running with an ungrounded secondary, or for using metallic arc lamp suspensions.

Yours, etc.,

X. Y. Z.

Communications upon the matters referred to above will be gladly welcomed for publication.—Editor.

The Stark Telephone, Light & Power System and the Toronto & York Radial Railway Company recently had a dispute because the railway's poles were placed on the only part of the road available for stringing wires on the Lake Shore road. The Stark people were thus unable to carry their current to light Mimico. They accordingly erected poles 40 feet high, or 10 feet higher than the radial's poles. But they soon came to a dead stop, for the Radial Company erected poles 45 feet high. Engineer Wyse of the Ontario Railway Board ordered that work cease, and the question of right of way will now be brought before the board.

## The Greatness of the Canadian West

"Facts," says the Wall Street Journal (New York), "are stubborn things, and they won't down. Mr. Hill and Mr. Harriman are clamoring for higher freight rates, notwithstanding the fact that they are dividing up twice and three times the profit that the Canadian Pacific is dividing among its security holders. These are great, bold, stubborn facts, and Wall Street should study them seriously. The Canadian West in 1884 had only a million bushels of wheat for export, this year it had 100,000,000 bushels, and in ten years it will have 500,000,000. It has a great railroad half completed between Duluth and Dawson City. The Canadian Northern is only 60 miles away from Duluth, and has 1,200 miles more to build before it reaches Dawson City. This year the Canadian Northern has handled 30,000,000 bushels of wheat, and the Canadian Pacific 70,000,000 bushels. In five years these two railroads will haul more wheat to the seaboard of the continent than all the railroads of the United States combined." The Journal goes on to say: "The Canadian West is fast becoming the granary of the world. Kansas grows but twelve bushels of wheat to the acre. Alberta has an average winter wheat production of 33 bushels to the acre this fall, and in the Canadian West there are 200,000,000 acres of virgin soil wheat lands. Alberta and British Columbia possess the greatest quantity of coal in the world, outside, perhaps, of Pennsylvania and its adjoining states. British Columbia possesses lumber resources greater than all the states of the Union east of the Rocky Mountains. British Columbia is, moreover, now recognized as the orchard of the Empire. The Canadian West is now drawing 100,000 of the best farm population of the United States away to the virgin lands to the north. That country is being developed, and be it remembered that the climate of Alberta and Saskatchewan is the climate of Germany, and that Edmonton and Berlin have the same climate and latitude. The Mackenzie Valley will grow finer wheat and more of it than the Missouri Valley or the Arkansas, just as the valley of the Neva will grow it, and for like causes. However unpleasant these facts may be to the people of the States, it is folly to blind one's self to the fact that the Canadian West is destined to supply beef and pork, and cheese and butter, and bread to the world. It has the soil, the climate, and the cheap transportation, and it will have the people."

## "Power" to be a Market Commodity

In the December number of "The Acolm," a bright and educative business magazine published by the Alcolm Company, 200 Broadway, New York, E. R. O. Gene says that "in the not far distant future 'power' will be a common commercial commodity—traded in for home or export use, just like so much grain, cotton or oil." Mr. Gene says that this will be rendered possible by the practical utilization of waste water rights and the storage or transmittance of the electrical energy by various methods. The energy will be "manufactured" within huge plants. In an interesting article the writer refers to an interview with the great Nicola Tesla, who is now working upon the completion of such a plant at Shoreham, Long Island. In the age of enlightenment that is fast approaching Mr. Tesla opines that the export of power will become the chief source of the income of many happily situated countries, such as the United States and Canada. Allusion is made to many other interesting possibilities in the field of electrical development.



# Current News and Notes

## Almonte, Ont.

At a meeting of the power owners of the Mississippi river held recently, it was decided to ask the Provincial Government to finance a scheme for damming the water in the vicinity of Cross and Long lakes.

## Barrie, Ont.

A by-law to raise \$12,000 for the installation of a two phase power line, for the erection of a separate transmission line, for the purchase of additional meters and transformers, for the erection of an office building for the Electric Light and Water Department, etc., will be submitted to the ratepayers.

The ratepayers will vote on January 4th on a bylaw to issue \$12,000 4½ per cent. 20-year debentures for electric light purposes. C. Donnell is Town Clerk.

## Bradford, Ont.

A staff of government surveyors have been in this vicinity for several weeks. It is rumored that there is a possibility of the Government abandoning the Holland Landing stream in connection with the canal to Newmarket and taking another course starting from the bridge. Another staff of surveyors have also been here for some time, surveying in the interest of the Metropolitan Electric Road, with a view of an extension of that line to this town next year.

## Chatham, Ont.

The ratepayers will vote on the power by-law this month, and there is every indication that the measure will be carried. It is the intention to erect a transforming station a few miles out of Chatham to distribute the power to Chatham, Blenheim, Ridgetown, Wallaceburg, Dresden and other towns.

## Dawson, Y. T.

Announcement was made here recently that Missouri capitalists, chiefly of Kansas City, had organized a company with \$10,000,000 capital to dredge the Stewart and McQuesten rivers, beginning operations next year with at least one dredge. This company and the Yukon Gold Basin Company, will install a joint power plant to drive twenty dredges.

## Emo, Ont.

The Telephone Company of this district are about to construct several additional miles of wire by extension among the farmers.

## Fort William, Ont.

A deputation from this city, which included Jas. Murphy, Mayor; J. T. Horn, President of the Board of Trade; E. B. Ryckman, K.C., and Geo., Graham, waited upon the Hon. Frank Cochrane, Minister of Lands, Forests and Mines, and Hon. Adam Beck, Chairman of the Hydro-Electric Commission, to ask that plans be made for the conservation of the water powers in the vicinity of Fort William. At its last session the legislature passed an act to permit the Government, through the Hydro-Electric Power Commission or otherwise, to construct a dam to conserve the waters of Dog Lake. The measure authorized an expenditure of \$20,000 on the work, but was not to become operative except by proclamation of the Lieutenant-Governor-in-Council. Fort William wants this dam built. The Kaministiquia

Power Company considers that the city should be allowed to build it. Port Arthur, too, is interested in the question. Some questions in respect of the rights of the power company are now before the Court of Appeal, and for this reason the Ministers deemed it inadvisable to make any statement to the deputation.

A bylaw will be submitted to the ratepayers on January 4th to raise \$18,000 debentures for extensions and improvements to the telephone system.

## Guelph, Ont.

The Niagara power scheme is opening up a new field for the construction of radial railway lines, and one of the first schemes is a line projected to run from Woodstock to Guelph through New Dundee, Plattsville and other towns, connecting at Galt with the T. H. & B. line. The promoters of the scheme are Messrs. Baird and McKee and other prominent business men of Plattsville, who have placed the project with the Central Securities Company of Toronto.

An important railway project for Western Ontario is under discussion. It is proposed to construct a new radial railway line from Woodstock to Guelph and connect with the T. H. & B. at Galt. Estimates will be obtained from engineers and a by-law will then be submitted to the people.

## Glencoe, Ont.

The ratepayers have approved a bylaw to raise \$11,000 for the installation of an electric plant to be operated by the municipality.

## Hamilton, Ont.

Application will be made at the next session of the Provincial Parliament for the incorporation of the Des Jardine Inter-urban Railway Company, who will construct electric or other railway lines from this city to Galt, Guelph and Burlington.

## Hedley, B. C.

The Hedley Power & Development Company has been formed to supply electricity to the mines. Application has been made for 2,000 cubic inches of water from the Simalkameen river, and a site for the plant has been selected. L. H. Patton, of Hedley, B. C., is secretary and treasurer.

## Halifax, N. S.

The Micmac Electric Company, Limited, capitalized at \$300,000, are applying for a charter to develop water power on the Port Medway river from which they will run a 12-mile transmission line to the Liepsigate mining district for the purpose of supplying the Micmac and other mines with power. It is also planned to operate an electric road for passenger and freight service.

## London, Ont.

The London Street Railway Company will take up negotiations for the extension of the trackage of the company early next year, so that work can be commenced next spring if a satisfactory arrangement can be arrived at.

## Montreal, Que.

Application will be made for the extension of the time limit of the Montreal Terminal Railway Company for the construction of their railway, and for power

to construct an elevated railway and other purposes. Archer, Perron & Taschereau are solicitors for the company.

## Niagara Falls, Ont.

The Ontario Power Company are preparing plans for the construction of a new pipe line to increase their capacity of electrical power by 65,000 horse power. Work will be commenced early in the spring. The work is made necessary to handle the contract with the Hydro-Electric Commission. The tunnel will be of steel, lined with concrete and be 30 feet in diameter and three-quarters of a mile in length. The work will cost over \$750,000. With the new line the company will be able to develop 180,000 horse power.

## Ottawa, Ont.

Application will be made to the government for a charter for an electric belt line from this city to Morrisburg, westward to Brockville, through Darling to connect with the North Lanark steam railway from Ottawa to Darling now being constructed. The proposed line would cover 143 miles and the estimated cost would be \$14,000 per mile, or \$2,002,000 for the whole undertaking.

## Peterboro, Ont.

A municipal power project is being formulated in this city. It is suggested that power be obtained from sources about 20 miles north of Peterboro. Otherwise, the civic authorities will ask the Hydro Electric Commission for an agreement.

## Pembroke, Ont.

The ratepayers have approved a bylaw to raise \$10,000 for the installation of an electric pump, 200 horse power motor, etc.

## Prince Rupert, B. C.

Under the general powers contained in its charter, the Grand Trunk Pacific Railway will install and operate a public telephone exchange at Prince Rupert. This will probably prevent another prospective company from entering the field. Details are now being worked out by Mr. A. B. Smith, the company's manager of telegraphs at Winnipeg.

## St. Thomas, Ont.

Notice is given of the incorporation of the Electric Laundry Company, Limited, capitalized at \$15,000, with head office at this city. The incorporators include D. Darrach, A. Cameron, G. S. McCall and G. W. Midgely, all of St. Thomas.

## Stratford, Ont.

Estimates of this city's share of the transmission line and cost of distribution for 1,000 horse power were submitted to the council on Monday night.

## Sudbury, Ont.

The ratepayers have approved a bylaw to issue \$19,200 twenty-year electric light and waterworks debentures. S. Fournier is Town Clerk.

## Toronto, Ont.

The Ontario Railway and Municipal Board have granted permission to the Street Railway Company for the construction of lines on the following streets: Adelaide, from Jarvis to Bathurst; Wellington street, from Church to York; Bay street, from Front to Queen; University avenue,



from Queen to College, and Richmond street, from Victoria to Church streets.

Application will be made at the next session of the provincial legislature for the incorporation of the Eastern Ontario Electric Railway Company for the construction of a line from Cornwall, Ont., to this city, and also from Ottawa to Brockville, etc.

#### Winnipeg, Man.

The City Electrician is proceeding with the construction of a telephone line from Stoney Mountain to the city quarry.

Tenders, addressed to the Board of Control, Winnipeg, for supply and erection of turbine pump, with electric meter for the City Water Works, will be received up to 11 a.m., Monday, February 22nd. Specifications and forms of tender may be obtained at the office of H. N. Ruttan, City Engineer.

Sealed tenders addressed to the Board of Control, Winnipeg, Canada, were received to Monday, 28th December, for the construction of the general works, and for the supply and erection of various portions of a transmission line between Point du Bois and Winnipeg. Plans, specifications and form of tender, may be obtained at the Power Engineer's Office, Carnegie Library Building, Winnipeg. Specifications may also be seen at the office of Smith, Kerry & Chace, Confederation Life Building, Toronto. Individual tenders will be received for: 14, general works at Point du Bois; 14, erection of transmission line; 15, steel towers; 17, electric transmission cable. As a further alternative, tenderers may include or group together one or more of the above items, providing that they have also tendered for the individual items of such group.

#### Windsor, Ont.

At the approaching municipal elections the ratepayers probably will be asked to vote on a bylaw to authorize the expenditure of \$25,000 or \$30,000 in order to provide a practically new lighting plant for the city. As an alternative proposition they may have an opportunity to express themselves on the project of purchasing Niagara power from the Hydro-Electric Commission.

#### Winnipeg, Man.

#### AWARDED.

#### Kelowna, B.C.

In connection with the electric lighting and waterworks systems which are being installed in this city, the Canadian Fairbanks Company, Vancouver, have the contract for the supply and erection of two 100 h.p. boilers, a 150 h.p. compound condensing engine direct connected to a 100 kw. 3 phase generator, together with condenser, heater, switchboard, 20 enclosed are lamps, transformers, etc., and an Underwriters' fire pump of 750 U. S. gallons capacity. The pole-line, transformers, etc., are being erected by the Hinton Electric Company, Vancouver. Gartshore-Thompson Company, of Hamilton, Ont., are supplying the cast iron piping, the Canada Foundry Company, Toronto, the hydrants and valves. The power house building was constructed by J. A. Bigger. Five hundred and seventy feet of riveted steel intake pipe were supplied by the Vancouver Engineering Company. W. T. Ashbridge, Consulting Engineer for the city, informs us that the approximate expenditure will be \$40,000.

#### Merritton, Ont.

The contract for transformer for stepping down from 2,200 to 110 volts, and for wire goose-neck lamps, and all other fix-

tures for a complete incandescent street lighting system has been awarded to the Robertson Electric Company, of Buffalo, their tender being considerably below those submitted by Canadian firms.

#### Sudbury, Ont.

\$19,000 debentures of this town, issued for the extension of the light and water services, have been purchased by G. A. Stimson & Company.

#### Toronto, Ont.

The Northern Electric & Manufacturing Company, Limited, have been awarded the contract by the Board of Control for fire alarm boxes at \$76 each.

#### Winnipeg, Man.

The contract has been let for the erection of an engineer's dwelling at Point du Bois, costing \$2,000, the dwelling to be built by the Power Construction Department of the city of Winnipeg.

The contract for 25,000 poles for the Government telephones has been awarded to J. L. Neilson, of Winnipeg.

### Miscellaneous Notes

Winnipeg Electric Railway has declared its regular dividend of 2½ per cent., for the quarter, to shareholders of December 19th. This is the regular rate.

Deputy Fire Chief Tremblay, of Montreal, who was in charge of the force while fighting the serious fire in Birk's jewelry store recently, claims that the fire was caused by defective insulation of electric wires. The wiring ran through the flooring, and according to his report the fire originated in the ceiling of the Birk's store.

The Cataract Power Company will make a determined effort to defeat the Brantford, Ont., bylaw to raise \$20,000, in addition to the \$55,000 already voted, and has commenced a campaign. An organizer has been appointed, and canvassers will be placed in every ward. The company claims that the aldermen have misrepresented its offer to the ratepayers.

It is not the intention of the Hydro-Electric Power Commission of Ontario to permit increases in the prices fixed for leases of land for its transmission line. It was said that in the case of Walter Death, of Toronto Township, the price for the easement would be increased to \$300. It is stated now that the option on this particular property has not yet been discussed by the commission as yet and that an arrangement such as was reported would not be considered for a moment.

Mr. J. J. Carrick, M. P. P., Mayor, and City Solicitor F. H. Keefer, of Port Arthur, consulted Hon. Adam Beck, recently in reference to the power situation in their city. They wished to urge upon the Government the advisability of proclaiming the Act respecting Dog Lake. The measure provided for the erection by the Government of a dam to conserve the water of Dog Lake and appropriated \$20,000 for the purpose. This, it is estimated, will provide a development of 30,000 horse power of electric energy.

With regard to proposed development by the Montreal Light, Heat & Power Company, of Montreal, Canada, which has enjoyed a remarkable growth, Vice-President Walbank writes as follows: "This company is at present preparing plans for an additional 100,000 h. p. plant for future needs. In explanation thereof, we have at present 12,000 h. p. or 15,000 h. p. of peak load, which lasts only three months of the year, and then only for about an hour.

It does not pay us to supply this power by water. We are, therefore, considering the installation of a steam plant to take care of this peak, and will probably put it in in instalments of, say, 10,000 h. p. or 15,000 h. p., as occasion arises." The plans have not yet been worked out fully.

### Electric Development in Japan

United States Vice-Consul E. G. Babbitt, of Yokohama, transmits an article from a local newspaper on the development of the electric industry of Japan from which the following resume has been made: The authorized capital of electric undertakings in 1903, 28,500,000 yen (\$14,193,000), of which 24,000,000 yen (\$11,952,000) was paid up, had risen to 138,000,000 yen (\$68,724,000) in 1907, of which 87,500,000 yen (\$43,575,000) was paid up. The electric works undertaken chiefly represented lighting and tramways. The number of lights supplied in 1903, 365,000, had increased in 1907 to 859,143. Tokyo and Osaka require each 100,000 lights. Electric tramways show equal development. In 1903 the mileage was 38, which rose to 119 in 1907, and will be largely added to by construction during the present year.

After reciting the foregoing progressive electric undertakings the newspaper article concludes as follows: "It is to be specially noted that while the works have been making steady progress not a few of the companies are in serious financial straits."

### The Production of Tungsten

The principal tungsten minerals are wolframite, a tungstate of iron and manganese and scheelite, a tungstate of calcium. Both minerals, like tin ores, occur as a rule in quartz veins cutting rocks containing much silica, such as granite and rhyolite. The deposits are usually pockety; that is, the ores occur in lenticular masses or shoots in veins. Those occurring at the surface are often quickly and easily mined, and it may then require all the profits made from the first exposed ore body to locate another one. In New Mexico, hubnerite and a small amount of scheelite occur with pyrite and lead minerals in a vein cutting limestone; and at Nome, Alaska, scheelite is found in the gold placers in a region of schists several miles from the nearest granite outcrops.

The greater part of the American tungsten product in 1907 came from the mines in Boulder County, Colo., which reported an output of 1,146 tons of wolframite valued at \$573,642.74. In California, which was the second state in order of production, the output was in the form of scheelite, as was also most of that from Montana. The total scheelite reported was 414 short tons. Small amounts of tungsten ores were also produced in Washington, Nevada, Arizona and New Mexico.

As a result of the increased demand for electrical purposes, the output of the United States was increased from a total of 928 short tons of concentrates carrying 60 per cent. of tungsten trioxide in 1906 to 1,640 short tons in 1907, while the value rose from \$348,867 in the earlier to \$890,048 in the latter year.

In other countries besides the United States the production of tungsten was notably increased during 1907. The output of Australia (including Tasmania), amounting to 1,643 tons, was, however, the only one that exceeded that of the States. Reports of production from South Africa, New South Wales and the northern territory of Australia show marked increases.



### Hydro-Electric Caused Depression

The directors of the Dominion Power and Transmission Company have sent out to the shareholders an explanation of their decision to suspend dividends. In addition to the extra expenditure on the Brantford and Hamilton plants, the financial depression, and the need of improving its street railway and other properties, the directors give the following as one of the reasons: The Hydro-Electric Power Commission proposed to come to Hamilton and divide up a ground already completely covered. That system could not be introduced in Hamilton to do business on a legitimate basis without public loss; but it will be easily understood that the threat of competition, backed by municipal and government support, has naturally had a most depressing and deterring effect on sales of our securities and necessary increases of capital for extensions. The preferred stock is cumulative, and the dividends will be paid on it later.

### Completion of Addition to Ontario Power Company's Plant

Work has been completed on the extension to the Ontario Power Company's power house at the bottom of the Falls, and the company will be able to develop electric energy to the amount of 70,000 horse-power. The completion of this work marks the successful conclusion of a contract which, when made, was regarded as an extremely hazardous one for the contractor. The contract was awarded on Sept. 15th, and, under heavy penalties, called for completion within 90 days of a building of reinforced concrete, 100 feet by 90 and 85 feet high. It is built at the base of the Falls, and enormous

difficulty was experienced in getting the concrete to set hard, on account of the excessive spray which blows from the cataract. To overcome this difficulty special forms were made in Schenectady, N.Y., which are really double forms, with an air space between. From Sept. 15th 400 men worked on an area 100 feet square, in an effort to complete the work within the time limit. The workmen could only work short shifts, for they were completely saturated in a few hours by the perpetual rain from the Falls. The generators and turbines will be installed by Messrs. Voith, Heidenheim, Germany, and will be the most modern of their kind. The contractor was Mr. H. D. Symes, of Niagara Falls, Ont., and the contract price over a quarter of a million dollars.

### Niagara Power for Western Ontario

Representatives of the municipalities of the southwestern peninsula met Hon. Adam Beck at Windsor, Ont., recently. The Minister of Power explained the Government's power scheme to the delegates, who represented Windsor, Walkerville, Sandwich, Amherstburg, Essex, Kingsville, Leamington, Wheatley, Tilbury, Chatham, Blenheim, Ridgeway and Bothwell. With Windsor included, and taking 5,000 horse-power, an estimate was given at \$34.90 per horse-power.

It was decided to establish transformers near Chatham, Windsor and Essex to supply the municipalities in this group. A resolution was passed that it was advisable for the municipalities in this district to take advantage of the scheme, and Solicitor Lobb will assist them in preparing by-laws for the municipal councils. Most of them will present the scheme to the ratepayers at the January elections.

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M. PETERSON,  
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Board of Control Office,  
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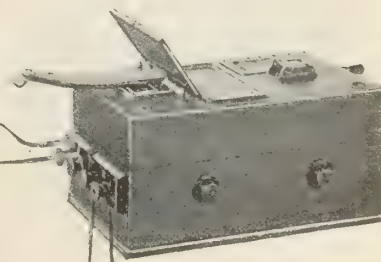
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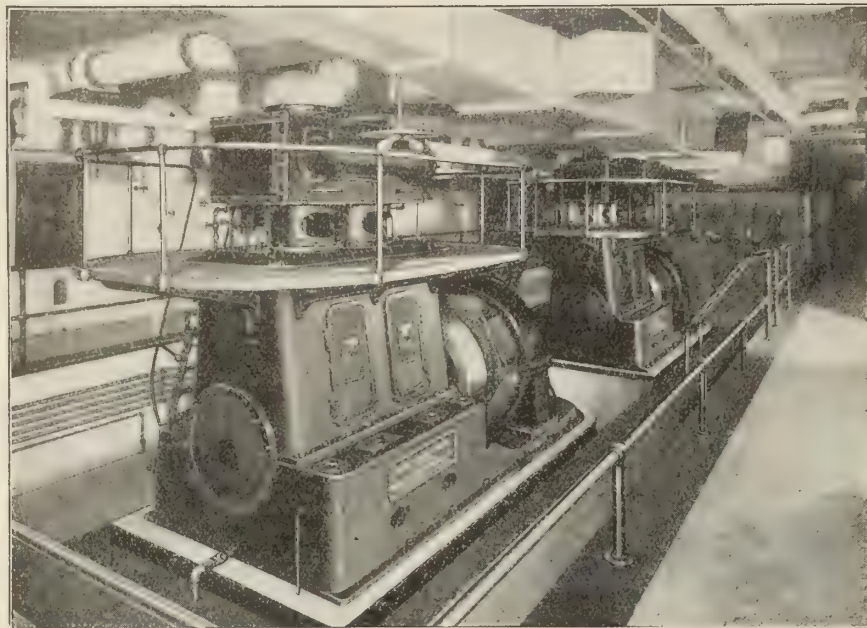
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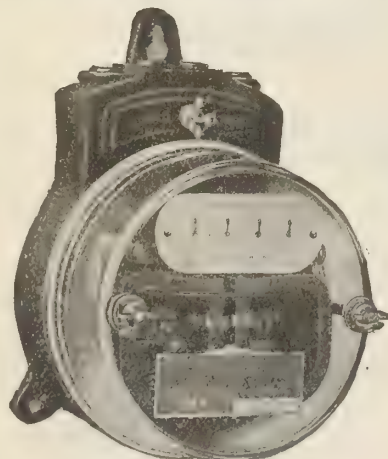
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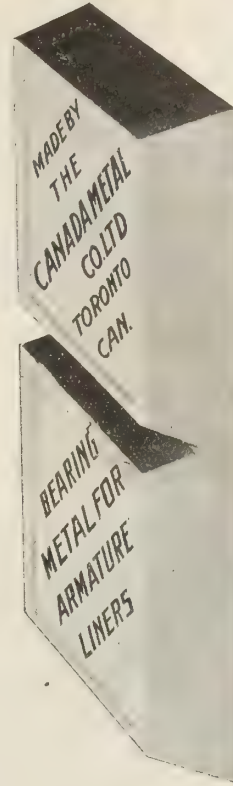
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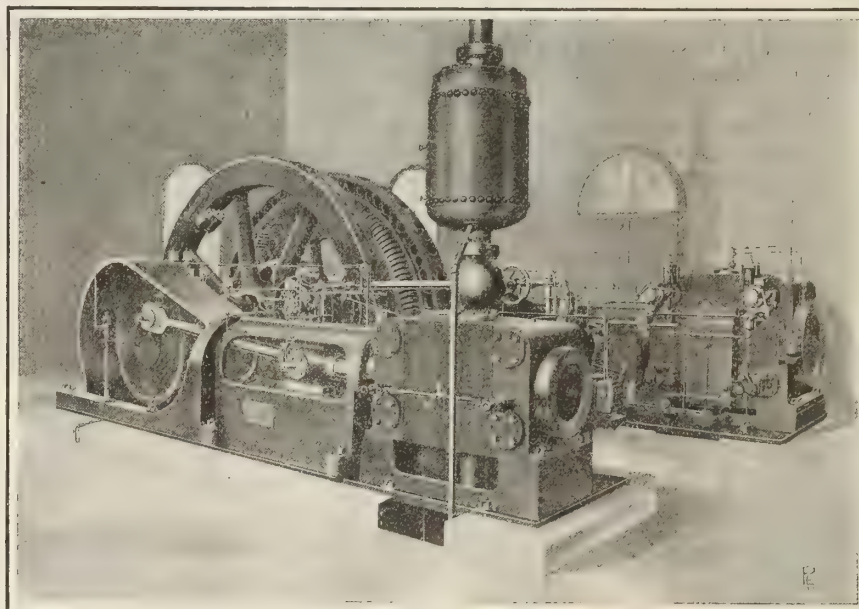


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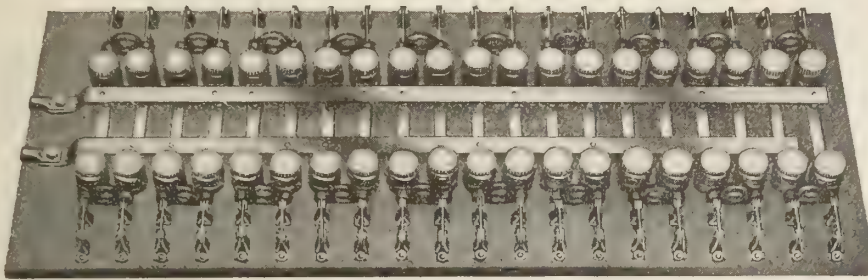
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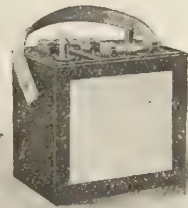
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**Small Power Plant vs. Central  
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The small power plants which are part of the mechanical equipment of many office buildings and shops are coming in for considerable discussion now, which seems likely to increase during the next year or two, as to their value to the owner in comparison with central station service. There are engineers with experience in the design and operation of these small isolated plants who hold emphatically that they are more economical than the purchase of current from central stations, while the representatives of the latter point in refutation of such statements to the large number of owners of buildings and shops who have thrown out their plants in order to buy current. Whether this action has been due wholly to a desire to effect economy or to the wish of the owner to be relieved from grating by the engine room force and its inrequent incompetency, is an open question in a good many cases. The fact remains, however, that so much has been said and written on both sides of the subject, and the debate between the advocates of the two methods of obtaining current is becoming so hot, that the man who pays the bills is likely to be pretty confused if he listens to all the arguments that reach him. The only way to find out whether it will pay to substitute central station current for an isolated plant, the latter being already installed, is to keep an accurate record of the total cost of operating the latter. It often happens that the engine room force attends to the work which will be necessary even if current is purchased from a central station, for the heating of the building must be provided for and the wiring, elevators and plumbing requires some maintenance. The number of men necessary for this work in a given building or shop ought to be estimated pretty liberally; and the division of their time between the actual management of the isolated plant and this other work should be ascertained carefully. The expenses for oil, fuel, water and other supplies and the depreciation of the plant can be figured if records are accurately kept, and having these figures the owner will then be able to decide whether it is worth his while to make a change.—Engineering Record.

The Frankfort, Germany, electric tramway lines at the close of the fiscal year (1907) had a length of 38 English miles and carried during that year 74,250,000 passengers. There are 612 cars for the passenger service, and the total number of employees is 2,124. On an average the electric cars run over 30,000 English miles per day. During the great International Turner festival last July, the number of miles run on some days exceeded 60,000. Though the fares are lower than in American cities (ordinary fare is 10 pfennigs, not quite 2½ cents), yet the net profit derived from the service turned into the municipal treasury was 1,315,000 marks (\$312,970). The profit realized during the year by the city from its electric lighting and testing plant aggregated \$400,200. The stride tramway travel has taken in Frankfort in the last decade can be discerned when comparing the above statistics with those of 1897, when the city bought out the then existing horse car lines which belonged to a Belgian joint stock company. Then the total length of lines was 19¼ miles, number of cars 197, which carried during said year 26,500,000 passengers and covered a running distance of 3,375,000 English miles.

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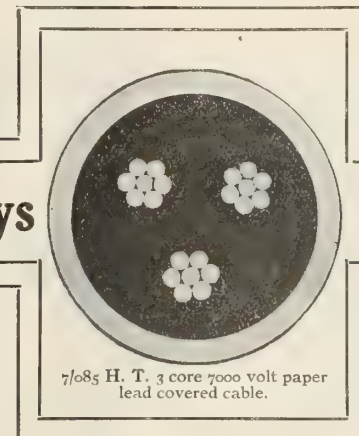
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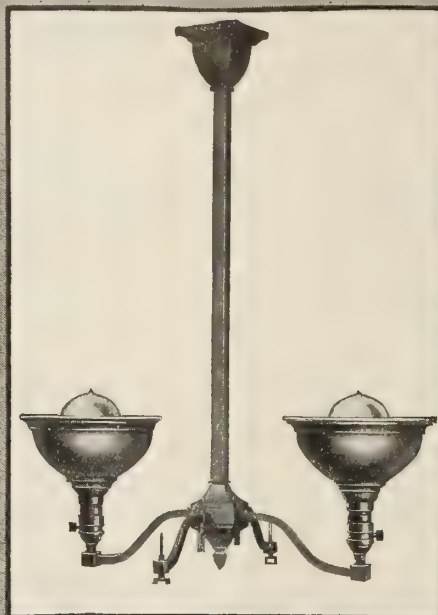
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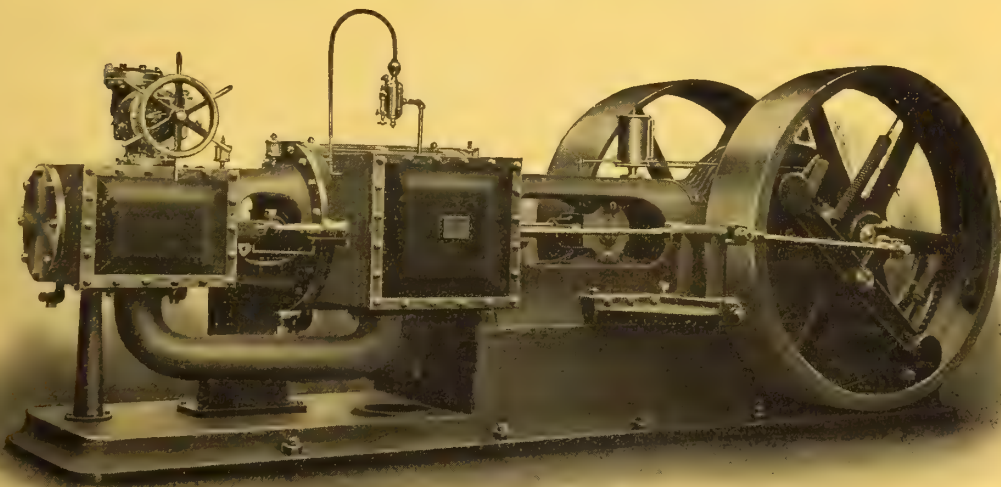
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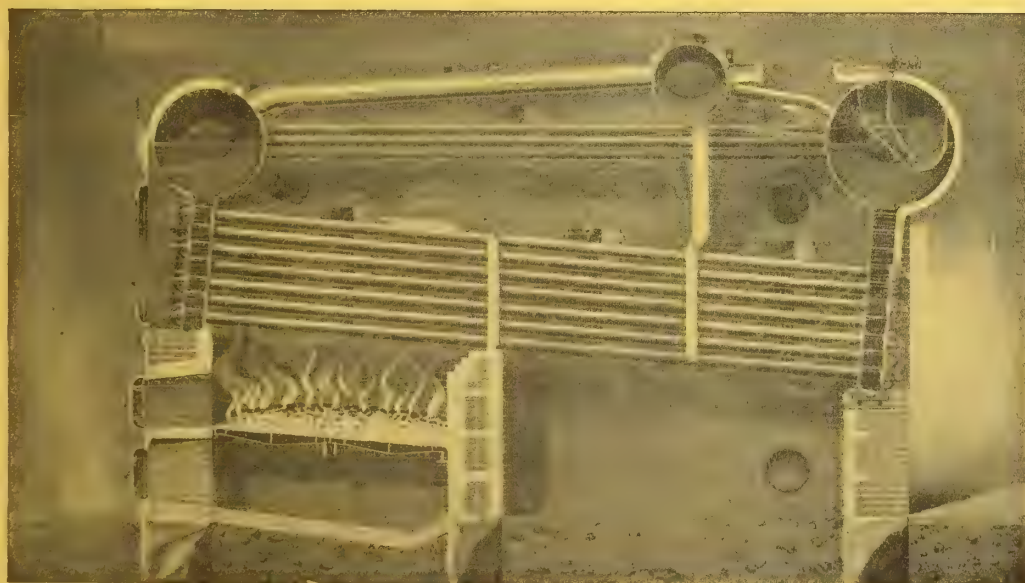
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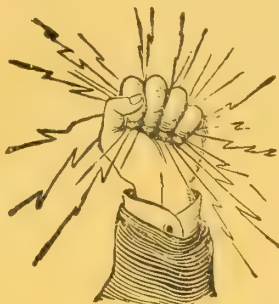
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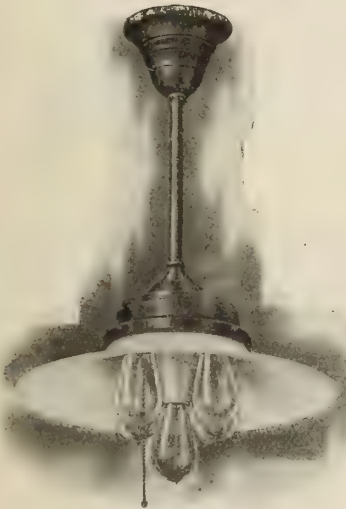
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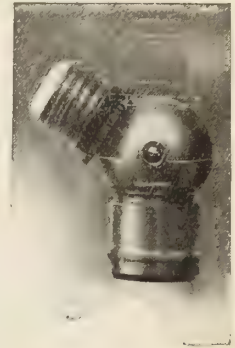
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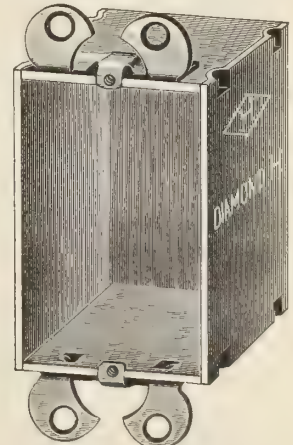
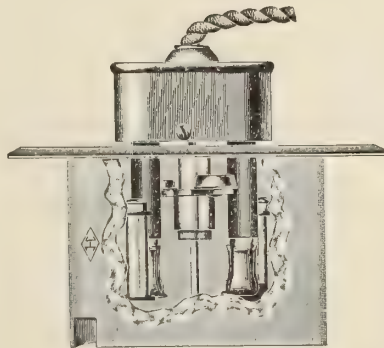
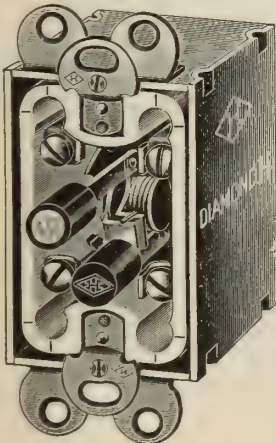
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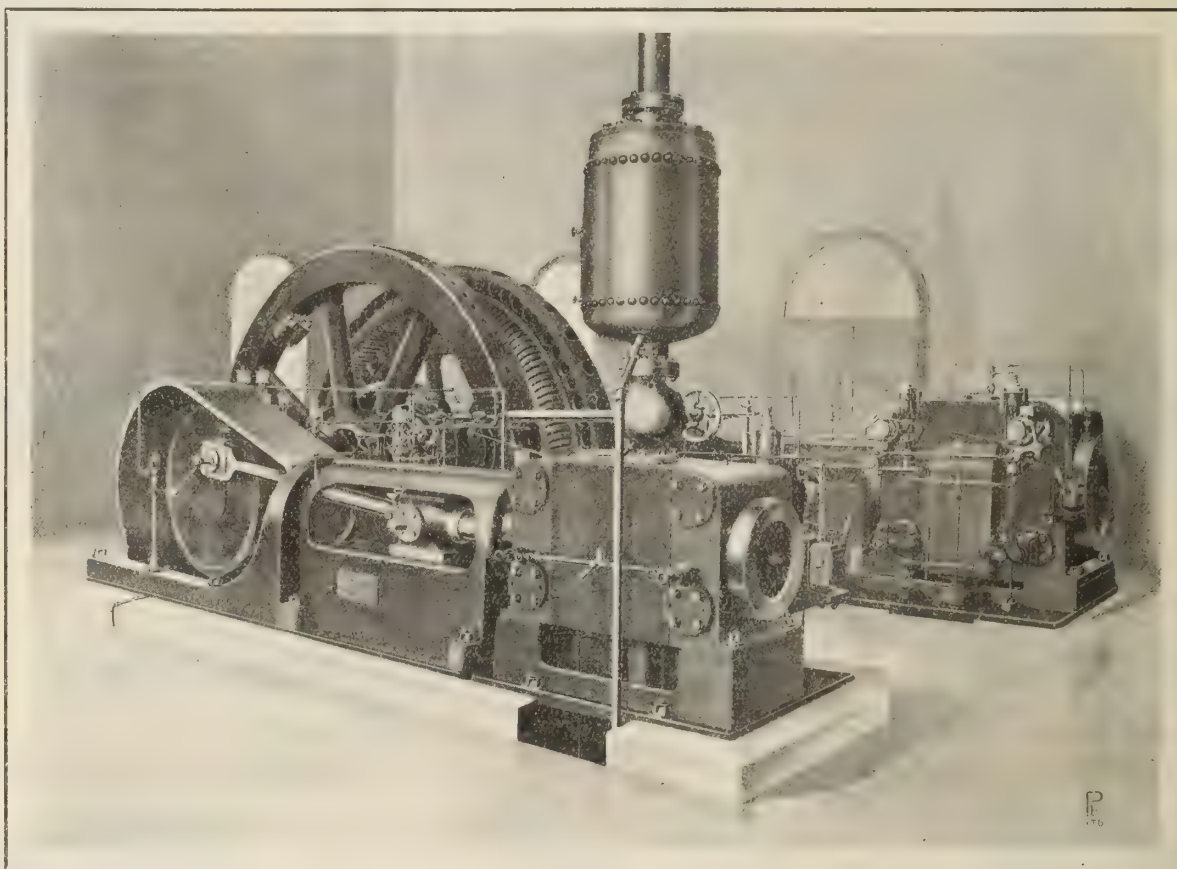


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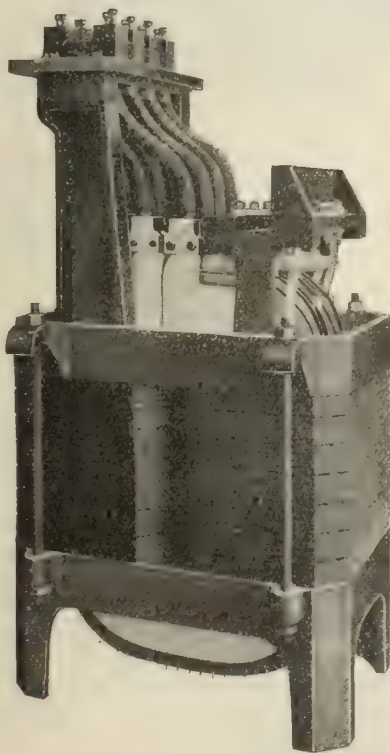
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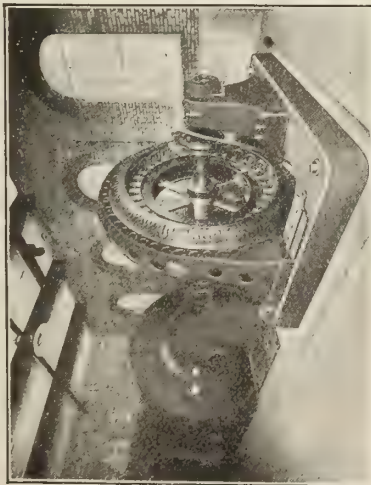
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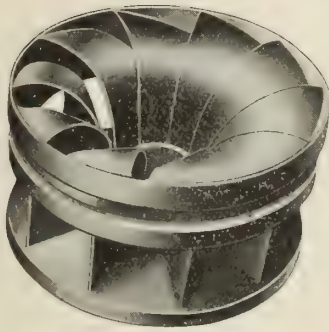
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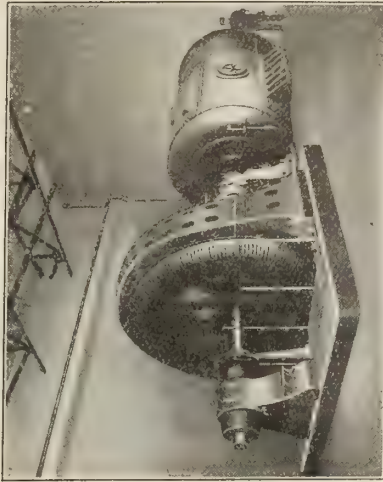
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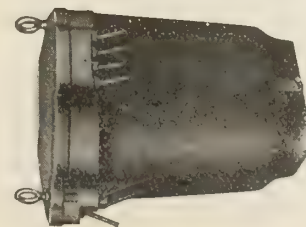
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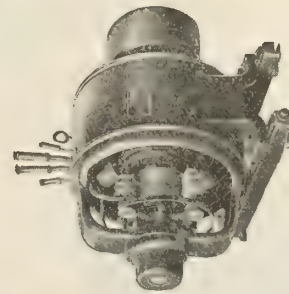
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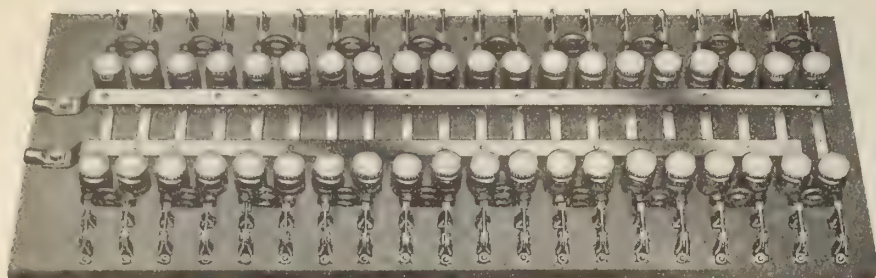


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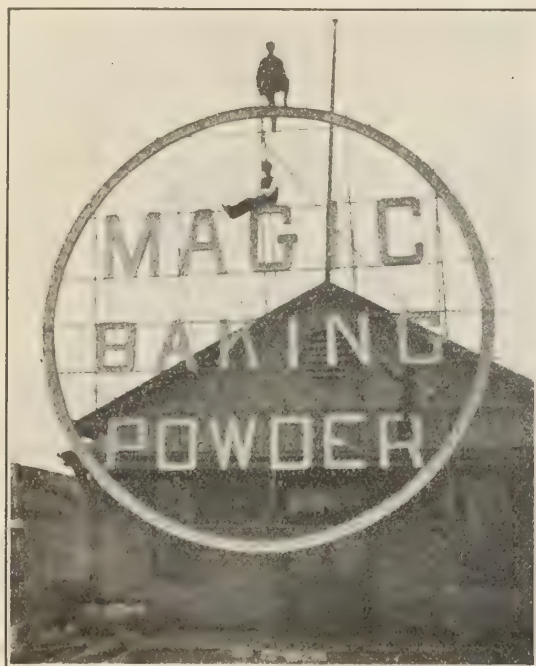


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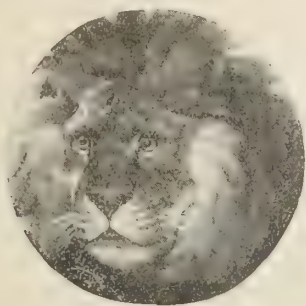
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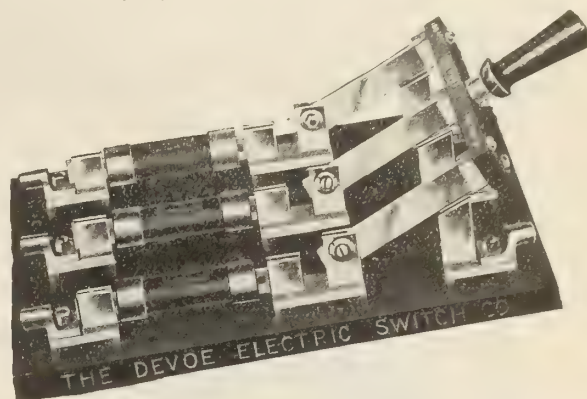


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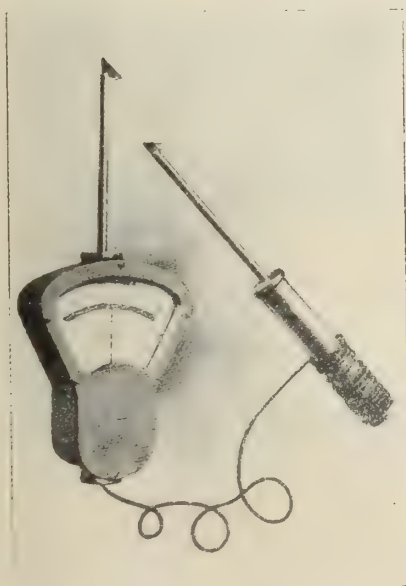
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## Personal Mention

Mr. Charles Mosely, chief engineer of the Toronto Electric Light Company, and Mr. William Corrigan, chief engineer of the physics building, Toronto University, have been appointed to the Board of Examiners for Stationary Engineers of Ontario.

Another change has taken place in the management of the Windsor, Essex and Lake Shore Electric Railway. Mr. John Piggott, of Chatham, who was president of the road from its organization has become vice-president and Mr. W. C. Crawford, of Tilbury, takes the place vacated by Mr. Piggott. E. E. Low, the former manager, has resigned, and Mr. Walter T. Piggott, of Chatham, has been appointed managing director. Other offi-



Walter T. Piggott, Chatham, Ont., new Managing Director E.W. & L.S. Electric Railway.

cers elected are: J. W. McColl, of Toronto, treasurer; W. B. Phillimore, Chatham, secretary.

Mr. Piggott was elected secretary of the company in July, 1906, and devoted much of his time since April, 1907, to looking after the construction and right of way items in connection with the completion of the road until it was put in operation. Mr. A. R. Dingman has been appointed his assistant. He is a practical railroad man, having had a good many years' experience on steam lines. The Windsor, Essex & Lake Shore road to-day is the longest interurban, single-phase electric line in the Dominion. The apparatus was furnished by the Canadian Westinghouse Company of Hamilton. The cars are 55 feet long, weighing 42 tons. The company are giving a two hours' service and are doing a good business.

The Crouse-Hinds Company, Syracuse, N.Y., have issued an extensive and attractive bulletin, No. 100, regarding their condulets. The bulletin is profusely illustrated and contains a price list of the various types of their condulets as well as of a large variety of other fixtures which the company handle.

## Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

1799. Screws, terminals, etc.—A London firm manufacturing screws of all kinds, terminals and all small turned work for engineers and electricians, wishes to increase business connections in Canada.

1803. Fuse.—A Midlands company manufacturing a patented enclosed fuse, and also fuse wire, would like to negotiate for its Canadian agency with some good resident electrical firm.

1837. Copper, nickel, manganese, etc.—A correspondent in Birmingham desires to obtain the agency of Canadian producers of copper, nickel, manganese, ferrochrome and tungsten.

1849. Boiler composition.—A Hull, England, firm of oil manufacturers is seeking the services of a live agent in Canada for the sale of a special boiler composition tablet for preventing incrustation in boilers.

1868. Agency for specialties.—A general machinery merchant in England would be interested in hearing from Canadian manufacturers of engineering specialties or appliances seeking export trade.

1889. Gas engines, gas plants, etc.—A London firm manufacturing high-speed gas engines, suction gas plants, steam engines, boilers and sawing machinery, wishes to increase business connections in Canada.

1891. Representation.—A London firm wishes to get into communication with some Canadian manufacturers of machinery, etc., who may require representation in Great Britain.

1942. Agency.—Inquiry has been made by a London firm manufacturing electric conduit fittings and accessories, for the names of firms in Canada open to take up their representation.

1980. Machinery.—A Cape Town commission merchant and general agent, with branches at Port Elizabeth, East London, Durban, Johannesburg, Lorenzo Marques and German South West Africa, desires to be placed in communication with Canadian manufacturers and exporters of electrical and mining machinery.

2056. Engineering specialties.—A firm of manufacturers' agents and merchants of electrical supplies and general engineering specialties, which they sell to shipyards, collieries, iron works and general engineering trades in the north of England, will consider best merchant terms and illustrated price lists from Canadian manufacturers of suitable lines.

2086. Inspecting engineer.—A London correspondent would like to hear from Canadian firms who might require the services of an inspecting engineer in Great Britain.

2088. Metal work, etc.—A Midlands guild of applied arts making artistic metal work, electrical fittings, lead work, etc., desires to hear from parties in the Dominion having an opening for the class of work in which they are engaged.

The "Electrical News" was favored with a dainty calendar for January by the Pittsburgh Transformer Company, Pittsburgh, Pa. This company has published an interesting booklet containing some illustrations relating to the operations in the manufacture of Pittsburg transformers and a brief description of the same. The booklet will be followed by a larger publication, entitled "Making Pittsburg Transformers," copies of which are promised to early applicants.



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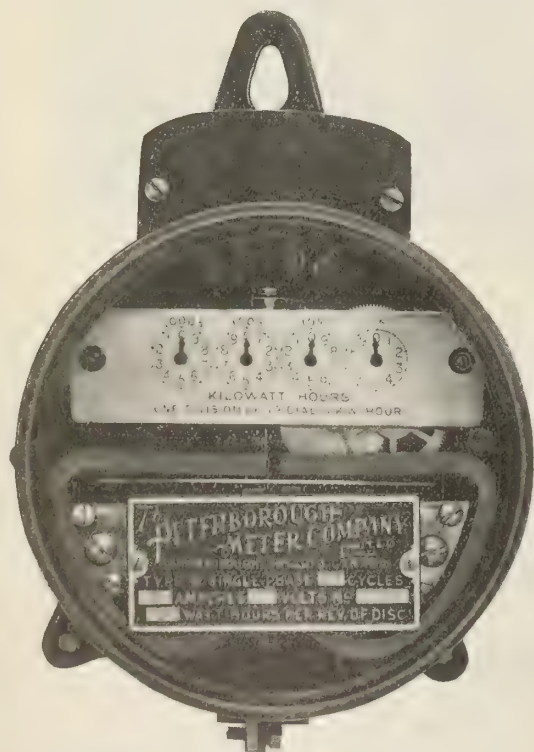
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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## Non-Synchronous Generators

A matter which has often been discussed, though only as a more or less curious feature, without any commercial value, is the fact that the ordinary induction motor, if driven by some external power, will deliver current to a line, providing certain conditions be complied with. These requirements are two in number, namely, that the speed of the motor shall be slightly higher than that of synchronism; secondly, that voltage be already present on the lines. If the speed be exactly synchronous, or lower, the machine acts simply as an ordinary induction motor running light, and if there be no initial voltage present to supply exciting current nothing results from operation at any speed, which is exactly what happens with any other type of generator when operated without excitation.

As is to be expected, the method of using a design which is practically never operated except as a motor produces several very peculiar results. The first of these, which will be better understood when one reflects that

the rotor of an induction motor never revolves at synchronous speed, and moreover that its speed varies from instant to instant according as its load grows lighter or heavier, is that it may be thrown on to the line at any instant, quite irrespective of its speed. In other words, it does not require synchronizing, obviously, an exceedingly valuable characteristic, though naturally the amount of exciting current drawn from the line will vary with the difference between the actual speed of the rotor, and synchronous speed. This again is exactly what occurs in an induction motor, which if thrown back onto a line before it has come to rest will take much less current than if it were standing still, only in this case we generally call it starting current. Then another peculiarity of the non-synchronous generator is that it will not supply current to a short circuit, because the fall in line voltage, which always results from every short circuit, simply takes away the generator field, seeing that it depends for its excitation entirely upon the potential of the line. This characteristic is, of course, most valuable, tending as it naturally does to reduce the damage done by a short circuit.

As far as the practical application of non-synchronous generators is concerned, very little can be said, as the proposition is entirely new, though we understand that the scheme has been used in one or two cases of emergency with entire success. At the same time, it may be that the principle will ultimately prove of commercial value, particularly in building the generating end of steam turbine units, because the absence of any winding, other than the short-circuited bar construction used in most induction motors, as well as there being no need for even collector rings, obviously allows a construction of the best possible form for withstanding the high speeds found in steam turbine units.

## Street Lighting Equipment

For quite a number of years the street lighting of our cities and towns has been accomplished along just about the same lines, namely, carbon arc lamps run off a small series-wound belt-driven generator, with here and there a few incandescents, operated, as a rule, off the multiple circuits. If the arc lamps were of the enclosed form they were, of course, quite satisfactory from certain points of view, but more frequently they are still of the open type, with all the flickerings and hissings and outages common to that form, to say nothing of the concentrated spot of light underneath the lamp, and the utter blackness beyond, which are characteristic of every open arc lamp, even when operating at its best. Then the incandescents, being of low efficiency and therefore not any too bright even when they were new, were generally so sickly looking by the time they were renewed that incandescent street lighting, to put it mildly, is not a form of illumination about which town councils grow wildly enthusiastic.

But within the last year or so a number of improvements have been made in this class of apparatus, being the culmination of a good many years of experiment and



investigation on the part of various manufacturers, so that to-day there is available an equipment for this class of work which is immeasurably superior to what has heretofore been the standard. In the first place the carbon arc, open or enclosed, direct or alternating, will doubtless soon be entirely superseded by the magnetite or some similar luminous arc lamp. The advantages of this latter type are many, chief among them perhaps being its economy, in that a lamp of this form, consuming but little over 300 watts, will give as much light as an enclosed carbon arc lamp of 480 watts. Moreover, this light is of a very superior quality, much whiter than that from any carbon arc; further, it is distributed at a much lesser degree below the horizontal, and consequently it covers a much greater area. This latter is a most important point in street lighting, for what is needed for that class of work is not a highly illuminated spot of comparatively small area, but a larger area less brightly lit, in other words, we want the light spread on very thinly, and that is exactly what the magnetite arc does. Besides the above advantages the magnetite lamp has another characteristic which appeals most strongly to the operating man, and that is this, namely, that it can be run off 25-cycle circuits without the use of moving machinery, a constant current transformer and a mercury rectifier forming a complete supply and controlling apparatus.

Then the carbon incandescent lamp is doubtless about to join in the march to oblivion, for without doubt the tungsten will soon supersede it, more particularly for series work. The advantages of this type of lamp are many, first and foremost, perhaps, being its superior economy, namely,  $1\frac{1}{4}$  watts per candle. This not only means an actual saving in energy of over 50 per cent., as compared with the best carbon lamps, whose efficiency is about  $2\frac{3}{4}$  watts per candle, but also that a given station equipment will now operate 200 lamps where formerly 100 were its limit. Obviously this is an enormous advantage to the central station, and one that will not fail to result in better service to the consumer.

### Standard Lamp Specifications

The question of the standardization of sizes, and of uniformity in practice and in specifications, has often received attention in these columns, as according to our views there are but few matters more deserving of the most serious consideration of those interested in the welfare of the electrical industry. It is naturally, therefore, a source of pleasure to us to be able to point to another decided forward step in this direction, namely, the advent of standard specifications for incandescent lamps, being those issued not long since by the Department of Labor and Commerce, Washington, D.C., and known as the United States Government specifications. They are the product of not only the issuing department, but of practically all the various interests concerned in the production and use of the incandescent lamp, in that all the principal manufacturers, the lamp testing bureau, and the large consumers, were repre-

sented at the conferences, in addition to the Department of Commerce. Obviously the results of the deliberations of such a gathering of authorities should be acceptable everywhere, being, in fact, equivalent to, and of equal standing with, an A.I.E.E. standardization rule. It is, of course, to be regretted that we have not got matters in such shape that we can look to the authorities at Ottawa for our guidance in questions such as these, still Canada is yet a young country, to whom all these good things will doubtless come in due time.

The advantage of adopting such specifications as these are naturally very many. Looking at the question first from the manufacturers' point of view, it will readily be seen that there are no requirements in them but such as are legitimate and capable of fulfilment at a reasonable cost, otherwise the manufacturers could not have agreed to them. On the other hand, though, it will be obvious that everything which it is reasonable to ask for has been enumerated, otherwise they would not have received the assent of the buyers. Then again, once such a standard comes into general use, the manufacturer is freed from the great vexation and cost attendant upon bidding to special and oftentimes commercially impossible requirements, to say nothing of the unwarranted expense so often incurred in filling contracts made under conditions which should never have been imposed, and which are of no real value to the purchaser. Further, as soon as a maker is assured of a standardized demand, he can devote all his machinery and all his processes to the production of the one general type which will best fill the demand, instead of having to spread his energies and production facilities over several designs. Lastly, all these advantages, while presented as pertaining to the manufacturers' side, are, of course, shared in by the consumer to an even greater degree, because whatever makes the manufacturers' cost go up, whatever delays him in furnishing information, in quoting, in making deliveries, etc., must inevitably react against the consumer. Conversely, anything which aids a manufacturer or dealer to give better service at a lower cost is obviously of great benefit to the consumer. That the adoption of such specifications as those referred to will do this must, of course, be patent to anyone who will seriously consider the situation.

The proper course of every buyer who purchases carbon incandescent lamps under specifications is therefore very plain, namely, adopt a standard like this, when you get the chance of such complete and authoritative specifications to be had for the asking, and thus not only do the best for your company and yourself, but also be of material help to all other users of the incandescent lamp.

A special meeting of the Orillia, Ont., Council was held recently and it was decided that the charges for electric light under municipal ownership should be reduced. For both stores and houses the price will now be 18 cents a lamp per month. This is a reduction of 10 cents for stores per lamp and 2 cents for houses.



# Some Practical Notes on Insulation Testing

## Various Methods of Determining Insulation Value—Paper By E. M. Wood, B. A. Sc.

Tests on insulation are usually made for one of two purposes—to determine the insulating value of various sorts of materials, or to find out if the insulation of some particular piece of electrical apparatus is sufficient to justify its being put into use, or continued in use. Tests for the first purpose are almost exclusively confined to samples of insulation, and are made in the research or testing laboratories of manufacturing concerns. Tests of the second sort should be made on every piece of electrical apparatus before it leaves the factory, and

following table is taken from the Standardization Rules of the A.I.E.E., sections 220-226:

Rated Terminal Voltage of Circuit	Rated Output	Testing Voltage
Up to 400 volts .....	Under 10 k.w....	1,000
Up to 400 volts .....	10 k.w. and over	1,500
Over 400 and less than 800....	Under 10 k.w....	1,500
Over 400 and less than 800....	10 k.w. and over	2,000
Over 800 and less than 1,200..	Any.....	3,500
Over 1,200 and less than 2,500..	Any.....	3,500
2,500 and over .....	Any. Twice rated v'l't'ge	

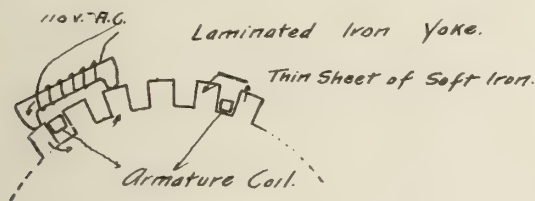


Fig. 1.—Device for locating Short Circuits in Armature Windings.

may, with advantage, be made from time to time on the apparatus as it continues in use. It is with tests of this latter sort that this article will deal.

There are two classes of insulation used in electrical apparatus; first, the "minor" insulation, separating the turns and layers of the winding from each other, and, secondly, the "major" insulation, which separates the winding as a whole from other windings and from the supporting frame or case. The insulation between turns may be tested by generating in the windings a voltage greater than their normal working voltage. This may be done in the transformer by applying twice normal voltage for one minute, or three times normal voltage for fifteen seconds to some section of the windings, thus inducing the same proportion of voltage in other windings on the same core. The applied voltage should be at as high frequency as possible to keep down "exciting" current. For a generator, the over-voltage may be obtained by driving it above normal speed, on open circuit, with all the excitation possible. One and a half times normal voltage will be about the maximum obtainable by this method. There are various methods of testing the wound armatures of generators and motors for short circuits between turns. One typical method is indicated in fig. 1: The portable laminated yoke shown is excited by current at 110 volts, a.c. The magnetic circuit is closed through the iron of the armature to be tested, so that the alternating flux surrounds one or more slots with their conductors. This sets up an e.m.f. in the conductors, and if there is a short circuit in the coil, heavy local currents in that coil are set up. The presence of these currents can be detected by the flux set up around the other leg of the coil in another slot, use being made of a piece of soft iron to detect the presence of this flux. In the case of a close winding there will be current and flux anyway, but the presence of the flux is much more noticeable if there is a short circuited coil.

The most important insulation test is the test for the strength of the "major" insulation. This is practically always applied from a testing transformer. The voltage to be applied depends on the rated voltage of the piece of apparatus and the use to which it is to be put. The

There are certain special exceptions noted. Transformers with primary pressures, 550-5,000 volts, whose secondaries are to be directly connected to consumption circuits should have a testing voltage of 10,000, to be applied between primary and secondary windings and between primary winding and core. Field windings of synchronous machinery to be started by a.c., with fields not excited, should be tested at 5,000 volts. The above voltages should be applied to the machine at the temperature attained in continuous operation. However, the above voltages should be applied to new machines only, or to machines newly insulated. For old insulation the test voltage should be lower, say from 50 to 75 per cent. than given in the table, depending on the condition of the machine.

Practically all electrical apparatus exhibits under high potential test more or less electrostatic capacity. The windings and the irons act as the two plates of a condenser, with the insulation as the dielectric. This capacity requires charging current of the value,  $I = C w E$  where  $E$  is the test voltage,  $C$  the capacity in farads, and  $w$  the frequency in radians per second. The capacity of the testing transformer should be such that it can supply to the test, the above current without instability of voltage ratio and without undue heating of its windings. Mr. C. E. Skinner, in an article on "Testing of Insulation," in the "Electric Journal," Vol. II., page 538, gives the

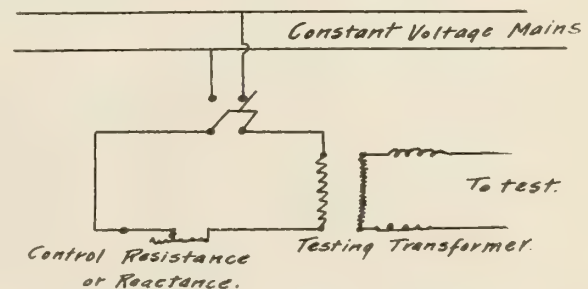


Fig. 2.—Testing Set with Resistance or Reactance Control.

following table of suitable capacities for various kilovolt ratings

E. M. F. Kilovolts	2	6	10	30	50	100	250
Rating K. W. ....	1	3	5	30	50	100	250

Since the tendency of an alternating voltage to break down insulation depends on its maximum instantaneous value, and since all a.c. voltage measuring devices indicate the square root of the mean of the squares of the



instantaneous values, it is evident that for the same voltmeter indication a.c. waves of different shapes have different power to puncture insulation. Therefore tests, to be consistent, should be made with a.c. waves of standard form, namely, sine wave form. The testing apparatus should be of such a nature as to produce, under conditions of test, a voltage wave form as nearly sinusoidal as possible. All tables of testing voltages, and all guarantees of insulation strength assume that the tests shall be made with a.c. waves of such form.

The severity of the test for a given voltage depends to a certain extent on the frequency, it being generally true that the higher frequencies give the more severe tests. Tests should then be made at some standard fre-

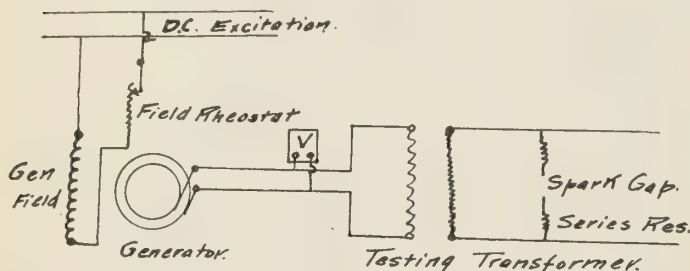


Fig. 3.—Insulation Testing Set with Generator Field Control.

quency, say 60 cycles, or better, at the frequency of the circuit on which the apparatus is to be used.

The test method of application of the testing voltage depends on conditions. Five of the more useful methods will be outlined.

1. By direct application from a constant potential circuit. This method may be used in all cases up to, say 2,000 volts, and in case of switches, insulators, etc., which have little electrostatic capacity for any voltages.

2. Voltage from constant potential circuit with testing transformer. Control of voltage is obtained by means of a resistance or reactance in the primary circuit as shown in fig. 2. A water rheostat, or a variable reactance, for example a "theatre dimmer," makes a suitable form of control. The reactance has the advantage of consuming less power, and of giving steadier control, as the water resistance is liable to fluctuate, due to the formation of gas on the plates. The method is useful for voltages up to 25,000. It has the disadvantage that the controlling resistance or reactance necessarily distorts the wave form of voltage. This is not of vital importance in tests up to 25,000 volts, but eliminates the usefulness of the method for higher voltages.

3. Voltage from generator with testing transformer, control is obtained by variation of generator field. Connections are as shown in fig. 3. The method is available for any voltage and any capacity. It has the disadvantage that it requires a special generator as part of the testing set. The method gives best results when the generator is worked at approximately normal voltage, practical limits of allowable variation being from 50 to 125 per cent. normal voltage. If these limits are exceeded the wave form is liable to be distorted by the load, and especially at low excitations the voltage will be unsteady if the transformer is loaded with "leading" current, as is the case in tests on high tension power transformers, cables and all apparatus with high electrostatic capacity between windings and frame. This method or the previous one is highly satisfactory for all high potential tests on other classes of electrical machinery. For testing apparatus like high voltage transformers and cables, one of the following methods is preferable.

4. From a constant potential circuit with a testing

transformer, with voltage control by auxiliary transformers whose sections are cut in or out by dial switches. Various forms are in use, one of the best of which is shown diagrammatically in fig. 4. This uses two regulating transformers besides the testing transformer. The voltage variation is in steps of one-quarter of one per cent. from zero voltage to full rated voltage, each of the regulating transformers being in 20 sections. The variation from step to step is made without opening the primary circuit, a very important advantage, especially in tests at high voltages. In case of break down the circuit breaker C.B., opens and allows current to pass through the choke coil, permitting the fault to be burned out if desirable. The voltage supply is usually from some generator which gives a proper wave form. This generator may supply power for more than one testing set if required. It may be convenient to make the testing set portable, and to bring out terminals from the supply generator at proper places throughout the factory, so that the set can be rapidly connected to any set of terminals. The above method is a perfectly satisfactory one for all conditions of high voltage testing.

5. Voltage from constant potential circuit with transformer, controlled by means of a single phase induction potential regulator in its primary circuit, as shown in fig. 5. The regulator must be of special design, with the same voltage in secondary as in primary, or in other words, with a "buck" or "boost" of 100 per cent. of the line voltage. Then when working on 500-volt circuit, with primary in maximum lowering position, the voltage at the transformer primary terminals will be  $500 - 500 = 0$  volts. The voltage can be raised gradually, by turning the hand wheel, until the primary is in maximum "boost" position, when the voltage at the primary of the testing transformer is  $500 + 500 = 1000$  volts. The worm-gear and wheel should be cut with a compound thread so as to give a very gradual variation of voltage. The regulator should work "snugly," so that there is no "play" in the movable parts, but should not be so tight that it cannot be turned steadily by hand. This method is quite satisfactory for all kinds of insulation testing. It has one advantage in that the experienced operator can judge by the way in which the "wheel" turns, approximately what is happening in the apparatus under test.

It is, of course, of great importance to be able to

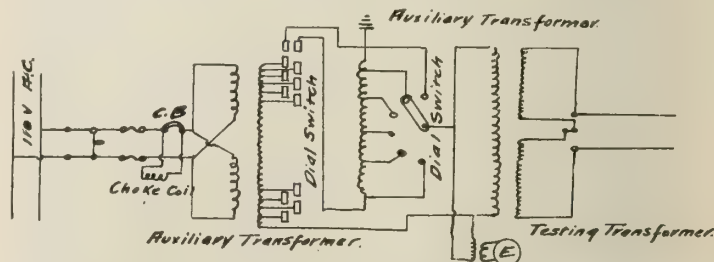


Fig. 4.—Testing Set with Control by Auxiliary Transformers.

measure with some degree of accuracy, the voltage applied in the test. There are at present no entirely satisfactory methods, though there are several in use.

1. By ratio of transformation, with voltmeter on low tension side of testing transformer. This method neglects "regulation" and is only useful where accuracy is not important, that is in tests up to 10,000 volts.

2. By special "voltmeter coil" of known number of turns on the core of the testing transformer. This is more accurate than the first, for it eliminates that part of the regulation due to the primary.

3. By special "voltmeter," this being part of the high tension winding. This is theoretically an improvement



on 2, but it must be taken off next to grounded terminal of the winding, and unless this is the middle of the winding these turns are liable to be not representative of the rest of the winding, on account of leakage fluxes, etc.

4. By voltmeter in the high tension circuit. This is the ideal method, but unfortunately it has serious practical limitations. The use of series resistance of potential transformer, with a voltmeter for 20,000 volts or over, would be too expensive and consume too much power for commercial use for measurement of test voltages. The static voltmeter, if there is a reliable one on the market, would be the best method available for the measurement of high voltages.

5. By spark gap in the high tension circuit. This method is the one most frequently used. It is not absolutely reliable, but with care yields fair results. The Standardization Rules of the A.I.E.E. state with regard to the use of the spark gap (Section 425): "The spark points should consist of new sewing needles supported axially at the ends of lineal conductors, which are each at least twice the length of the gap. There should be no extraneous body near the gap within a radius of twice its length."

To prevent a large rush of current and consequently high voltage surges when the gap breaks, there should be inserted in series with each of its terminals, a resistance of one-half ohm per volt. These resistances may be carbon resistance rods, similar to those used in lightning arresters. These resistances usually decrease the gap setting for a given voltage by an amount which should be determined experimentally (about 5 per cent).

Moderately low voltage tests, say up to 30,000 volts, require no particular care in application, except that they should be isolated so that no one will get hurt, and that the application of voltage should be fairly smooth. Voltages over 10,000 should be checked by spark gap in high tension circuit.

Voltages, 30,000 to 80,000, require more care in applying the voltage smoothly and removing it smoothly—that is, without sudden vibrations. The spark gap should be set for the required testing voltage, with the apparatus to be tested connected in as shown in fig. 5, and the voltage raised until the gaps arcs over. Just before the break, a voltmeter reading should be taken. As soon as the gap breaks, the voltage reading should be taken. As soon as the gap breaks, the voltage should be lowered to zero and the gap opened say 10 per cent. beyond the setting for the required voltage. Then voltage should be applied again with the same voltmeter reading, and held one minute, then lowered to zero. A break is indicated by the drop of the voltmeter needle to zero, and by the action of the apparatus, as burning usually follows a break-down.

At voltages higher than 80,000, with apparatus of high electrostatic capacity, it is dangerous to break the gap at full test voltage, for the arcing gap sets up voltage surges of the worst sort. The difficulty may be obviated as follows: The gap may be set at two-thirds the required voltage, and broken, with the transformer in circuit, the primary voltage being read just before the break. The voltage should be reduced to zero, and the gap opened to 10 per cent. above the distance for required testing voltage. The voltage should be then applied till the voltmeter reading is three-halves its former value, held for one minute and lowered gradually to zero. This method is sometimes satisfactory and sometimes not satisfactory. Variations are suggested by experience to fit the various conditions that arise with the different sorts of apparatus that are to be tested.

There is another insulation test, the measurement of

"Insulation Resistance." This may be done roughly by a well-known high resistance voltmeter method, or by direct megohm-meter. It is chiefly of value in determining the state of the insulation with regard to moisture, since the greater the degree of moisture, the lower the insulation resistance. Any piece of apparatus that shows low insulation resistance (below one megohm) should be carefully dried out before an application of high potential is made.

This article will conclude with a few general practical suggestions on making the insulation tests.

1. Since the voltages used in insulation testing are all dangerous to life, too great care cannot be taken to prevent any person coming in contact with the live circuits.

2. When a machine has more than one winding, all windings except the one under test should be carefully connected to the frame, which should preferably be grounded. This is to prevent undue electrostatic stresses being induced, tending to break down the insulation from these windings to ground.

3. If there is more than one accessible point in any winding to be tested, all accessible parts should be carefully connected together electrically. This is to insure uniform application of voltage to all parts of the winding, and is a very important point. It often makes the difference for a piece of apparatus between standing the test, and failing.

4. Application of voltage should be gradual, without sudden variations but not too slow, as the severity of the test depends on its duration. For a test of 160,000 volts to a large transformer, it would be a good rule to take

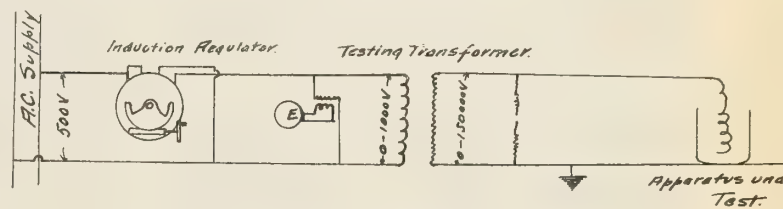


Fig. 5.—Insulation Testing Set with control by Induction Regulator.

one minute to raise the voltage from 0 to 160,000 volts, hold at that value for one minute, and take one minute to lower the voltage to zero. No apparent impending breakdown should induce the operator to make a sudden reduction in testing voltage, for if he does, the break will become a certainty.

5. Any means possible of reducing the static discharge in a high tension test, is of advantage for the static discharges are liable to set up surges which may cause break down of insulation.

6. All connections should be made tightly and with good contact.

Hon. Adam Beck, chairman, and Mr. A. F. Lobb, solicitor of the Hydro-Electric Commission, held a conference with the Stratford, Ont., City Council recently. The result was that estimates of Stratford's share of the transmission line and cost of distribution for 1,000 horse-power were sent to the Council for a subsequent special meeting. Stratford's former request was for 1,500 horse-power, and a clause in the by-law adopted by the ratepayers in January, 1907, restricts the Council to making a contract at a price not exceeding \$24.50 per horse-power delivered and stepped down.



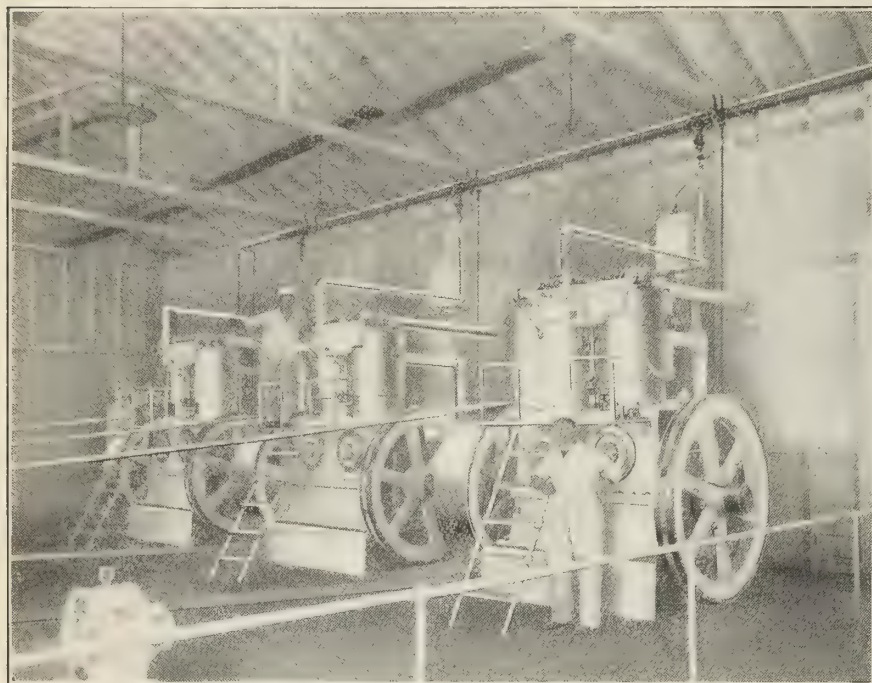
# The Crystal Beach Gas Engine Power Plant

Interesting Installation at an Ontario Amusement Park—Three Gas Engines in Parallel.

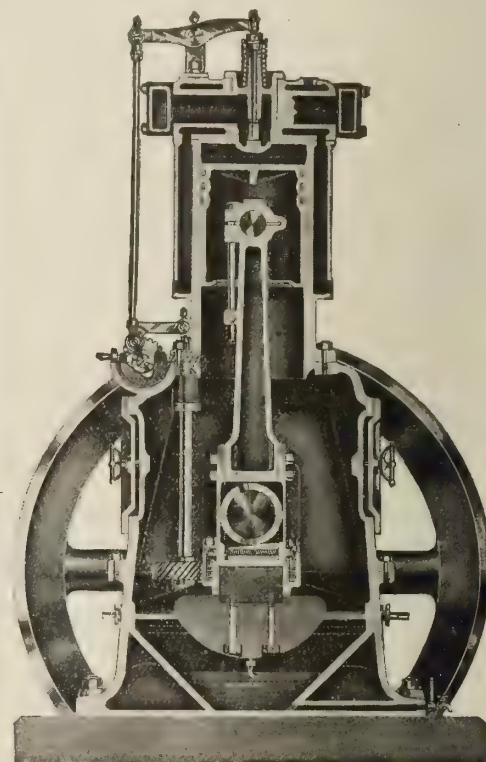
One of the largest and most interesting gas engine power plants in Canada is that at Crystal Beach, Ont., on the shore of Lake Erie near Ridgeway, Ont. This resort has come to be known as Buffalo's Coney Island. It was recently purchased by Buffalo and Cleveland capitalists and entirely rebuilt at an expenditure of about one million dollars.

Seven thousand electric lights are used in the illumination of the grounds. These and the operation of the amusement devices, the water supply and other power needs, necessitated a power plant of a total ca-

board was furnished by the Canadian General Electric Company, and is four panels, of Vermont marble with Weston instruments and General Electric switches and circuit breakers. The motors range from 75 horse power in the scenic railway to one-quarter horse power in the rifle range. The decorative and outline work is all done with 4 candle-power lamps while the midway is lighted with 8 candle-power. The remarkable part about the plant is that it was practically installed in three weeks. Expensive additions are being planned for 1909, including the building of a new hotel with power elevators,



Gas Engine Plant at Crystal Beach, Ont.



Crystal Beach Gas Engine.

capacity of about 500 horse power. After considering the details of the cost of steam, and of power from Niagara Falls, it was concluded that gas engines, operated on natural gas fuel, which is plentiful in that neighborhood, was the most economical. The plant is now reported to be producing electricity for light and power at a cost of one-third of a cent per K.W. hour. The gas engines used are LaZier double cylinder vertical gas engines, 125 horse power each, manufactured by the LaZier Gas Engine Company, of Buffalo.

The engines are belted to 85 k.w. generators, d.c., 250 volts, made by the Canadian Westinghouse Company. These are compound wound, 750 R.P.M. type "S" generators, with rails, pulleys and rheostats. The Canadian Westinghouse Company also furnished a third machine of the same capacity as the above, but operating at 875 R.P.M., and a 75 horse power 220-volt type "S" shunt wound motor operating at 700 R.P.M. and built upon the 12-L frame. The three-wire system is used for lighting, and a balancer, built by the Canadian Westinghouse Company, is also installed. The switch-

the installation of electrically driven moving stairways, etc.

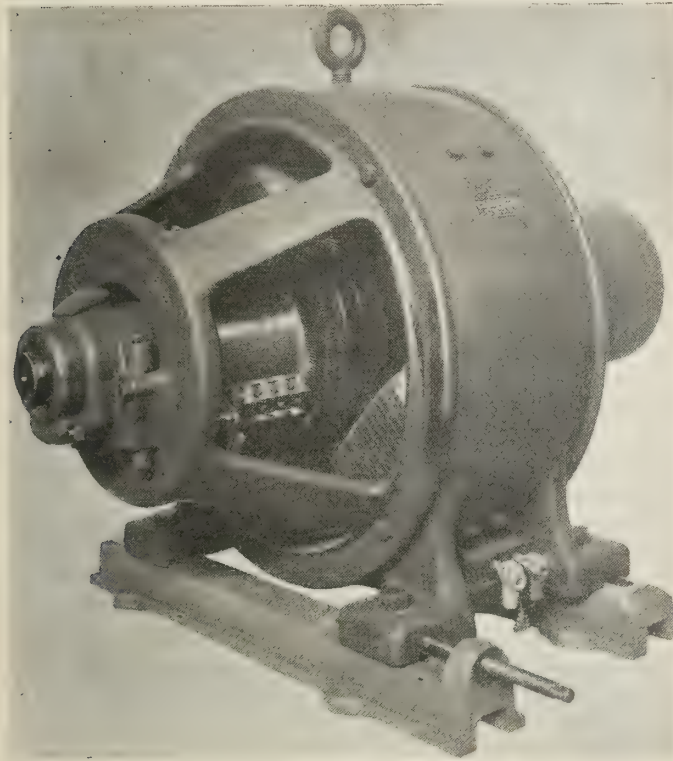
The power house at Crystal Beach is a new building specially constructed, and is 70 feet deep by 40 feet wide. The engines and generators are mounted on concrete foundations, and a concrete pavement has been laid over the entire floor of the building. The Lake Erie Excursion Company have made the power house one of the show features of the place. The interior of the building is painted white, and the engines have been enamelled in white, presenting the unusual appearance of an engine house and all its machinery spotlessly white. Contrary to the general expectations of electricians, the engines are said to be working perfectly in parallel.

An interesting fact in connection with the installation of this plant is the speed with which it was carried out. The piping of the engines was not completed until three o'clock in the afternoon of the opening day. The gas was turned on at five o'clock, and the engines were put directly into service. A complete illumination was furnished for that evening and an uninterrupted service



given from then on. In connection with the gas engines an interesting feature is that all the mechanism is placed on the outside, where the cam shaft operates in a bath of oil in constant view of the operator. The ignition mechanism is placed on the ends of the cam shaft, within convenient reach for starting and running positions, and ignitions can be equalized with the engine in motion.

The introduction of take-ups for taking up the lost motion in the connecting rod did away with the principal objection to the vertical type of engine. These take-ups are so placed that they are away from the thrust of the explosion and can be reached quickly for adjustment. The hand-hole plates are fitted with hand wheels, and with their fittings can be readily removed and replaced.



Canadian Westinghouse 85 K.W. Generator,  
D.C. 250 volts, at Crystal Beach.

The head openings are large enough to permit of the entire crank shaft and cranks being removed without separating the upper and lower base. The engineer for the company is Mr. Stuart M. Conant, C.E., Buffalo.

### A Dangerous Legal Decision

The result of the decision handed out by the Court of Appeal recently as to the validity of certain gold bonds issued by the Poole Publishing Company shortly before assignment, and the priority of claim thereby given to the holders of such bonds, seems to indicate that mortgages or liens of any kind, whether secured by real estate, buildings, book debts, stock in trade, plant and machinery, copyrights, or any other assets, may be superseded by this new form of gold bonds without registration of any kind and without the knowledge of the ordinary creditor. Such a far-reaching decision, involving, as it does, the foundation of all credit business, which it threatens to undermine, should be thoroughly investigated and, if necessary, a legislative remedy should be immediately applied.

### Will Cheapen Sprinkler Installation

The excessive cost of the installation of automatic sprinklers for fire fighting has to a large extent prevented their installation up to date. This cost is attributable to the expense of submitting provisional plans and providing for inspection and also to the exacting demands which are made by the companies as to the character and extent of the equipment. Sprinkler contractors have each to send a representative to inspect, measure and lay out equipment, and the aggregate cost of this service must be added by all contractors to the general cost of the business. A measure of relief will probably be afforded by a course which has recently been adopted by the insurance department of the Canadian Manufacturers' Association. This department is now in a position to prepare plans and specifications and to superintend the erection of sprinkler systems under the regulations of any existing insurance organization. A saving can be effected in this manner of from \$200 to \$500 for each installation and in many cases even more may be saved. This should result shortly in a material reduction in the cost of such installations. Another fact of importance in connection with the same subject is that modified systems of sprinkler protection involving much less cost and carrying reductions in rates are receiving the attention of the department. There are many manufacturers who are not prepared to install these systems up to the exacting demands of the companies, but would readily provide a more modest outlay in consideration of receiving commensurate benefit.

### Sulphur Removal in Induction Furnace

In "Stahl und Eisen," Mr. A. Schmid discusses the rationale of the removal of sulphur from steel in the electric induction furnace. He does not deny that on account of the high temperature, which can be produced in the electric furnace, highly basic slags remain fluid and have an increased effect. But he thinks that this is not the complete explanation. He offers the hypothesis that there is a specific effect of the electric alternating current itself, which causes the desulphurization under simultaneous action of oxide ores. The use of oxide ore seems important, as is shown from results obtained by the author at Gurtneilen. The results are given of various furnace runs, in which the author found that the sulphur in the steel bath was greatly reduced, while the slag remained free from, or low in sulphur. What then has become of the sulphur? The author thinks that the sulphur is oxidized by the oxide ore and escapes as sulphur dioxide into the air. He thinks that this is a specific effect of alternating currents and would not take place with direct current, but no proof of this is given.

### Fort Frances' Power Possibilities

As a prospective hydro-electric centre Fort Frances has strong claims. It possesses water power that can be developed to an enormous extent. It is situated at the junction of the Rainy River (so-called from a corruption of the French word "Reine," signifying Queen, which was given to the huge river by an early French explorer) and Rainy Lake. The river is a broad swift-flowing stream, and from its rushing waters the Canadian Northern Railway is seeking to obtain the energy that will provide power for the future factories of Frances. The work is rapidly progressing, and before long Rainy River will be among the best equipped, as far as water power is concerned, in Canada. The project at present in hand will cost \$3,000,000.



# Electric Railway Department

## Electric Switching Systems

It seems strange that most trolley companies persist in keeping up antiquated mechanical systems of switching, when automatic electric systems are in practical use both here and abroad. On some lines the motorman is even still obliged to throw the switch himself, with an iron rod kept on the front platform for the purpose, while on the more up-to-date systems a special switchman by the roadside operates a lever as the passing cars are to go over one or the other branch. In the electric systems it is necessary only for the motorman to throw off his controller or keep it on, as he approaches the switch; the automatic mechanism does the rest. The latest improvements in electric switching are described in "Cosmos" (Paris) by Georges Dary, part of whose article has been translated in "The Literary Digest" as follows:

"So far as we know, only three electric switching systems are now in existence. The first was invented in England by Dixon in 1904 and installed on several tramway lines, among others at Leeds, Bradford, and Sheffield. A second similar device dates from the same year

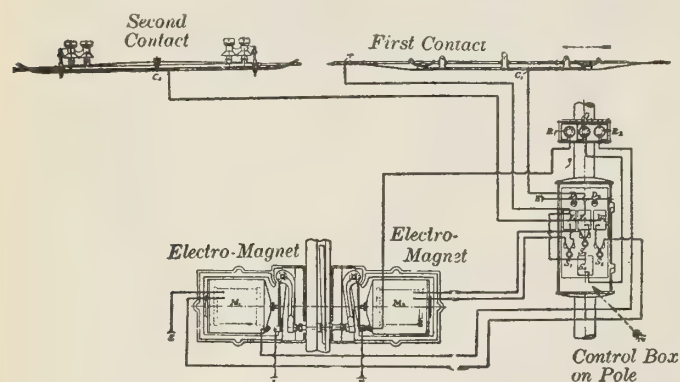


Diagram Showing Details of Electric Switch.

and is used on the suburban trolley lines of St. Louis, Mo. Finally, a third has been devised and put into use at Bristol by Messrs. Tierney and Malone . . . .

"The principle common to these systems is the establishment of two insulated contacts on the trolley wire. These are connected with a box containing an electro-magnetic mechanism which moves the switch. If the car is to continue its course on the main line, the motorman, when approaching the switch, cuts off the current with his controller and does not make connection again until the trolley has passed the first contact on the wire. In this case no current traverses the switching mechanism, which remains inactive, and the car continues on the main line. If, on the contrary, the car is to turn off on the branch line, the motorman does not touch the handle of his controller, the current passes through the switching mechanism when the trolley wheel passes the aerial contact and the switch is actuated. Everything returns to the normal position when the trolley wheel passes the second point of contact.

"If, now, we examine in detail the latest of these mechanisms, that is, the one of Messrs. Tierney & Malone, we see that everything is arranged to obtain certainty of action of the switch and to notify the motorman as the necessary movements are successively carried

out. The line is in no way obstructed and all that is visible to the eye is a simple iron plate on the ground, similar to those used in other switches and covering the switching mechanism. A central column, or simply a post between the two diverging lines, bears the box of connections and the signal lamps. The diagram shows the details of the installation, including the two contacts on the trolley wire, the box of connections at the right, and the two electromagnets controlling the switch."

These magnets ( $M_1$ ,  $M_2$ ) are connected with levers that put the switch over or back as one or the other is thrown into circuit. The contacts are on parallel branches of the trolley wire, and are so arranged that the first operates one of the magnets, and the second the other one. This latter, which holds the switch in the normal or main line position, is in circuit, except between the making of the two contacts. A branch circuit lights the red lamps ( $R_1$ ,  $R_2$ ) in the signal post when the switch is thrown. The central lamp, which is green, remains always lighted and notifies the motorman, as he approaches, that the connections are in good order and that the switch is ready to be operated. It will be noted that while the motorman must close his controller if he wishes to continue on the main line, he has nothing at all to do in the other case, the switch acting absolutely automatically. We read further:

"In the two earlier systems the rail is held in its normal position by a spring, and is moved by a single electromagnet. Here it is moved in one direction or the other by two distinct electromagnets, and this apparent complication is really an assurance of better working. In case the current should be interrupted, the switch may easily be moved with a crowbar.

"We have assumed that the line is served by an aerial trolley wire, but the latest system is equally applicable to the underground conduit or to the 'third rail,' that is to say, it may be used with any ordinary system of urban electric traction."

## Changes in Railway Operation Due to Electricity

The changes which the substitution of electricity for steam are destined to bring about in railway operation are outlined in an interesting article contributed by Earl Mayo to Appleton's Magazine.

"One development of the future," he writes, "will be the operation of electric cars through the streets of suburban towns, gathering passengers from their homes and then running at express speed over the tracks of the railway to the city, to continue by subway, surface, or elevated lines to the heart of the business or shopping districts. The greatest loss of time in this form of travel at present is at either terminal. A man who lives in a town fifteen or twenty miles from the city and whose house and office are each a mile or more from the railway station, will spend as much time in covering the two miles at the ends of the line in making connections as he will in traversing the much greater distance between the suburban town and the city. The two nickels which he pays for this service is just about equal also to the amount he pays the railway in commutation for the longer journey. The introduction of cars which would enable the commuter to make the entire trip from his home to his office without change would reduce the time



spent in getting to and from the station about two-thirds, while the expense would be materially lessened as well. That President Mellen has some such possibility as this in mind may be indicated by his acquisition of the franchise of a proposed high speed electric line extending from New York into the suburban territory to the north and east of the city and having a terminus at the northern end of one branch of the city subway system.

"The same system will apply to practically all local passenger travel. It is now in operation on various sections of the New Haven lines. One of these is between Norwich and Central village, Conn., and another is between Middletown and Berlin in the same State. The big, double-truck electric cars used on the electric lines owned by the railway pass through the streets of one to the next, there to resume their course through the streets in the manner of the familiar trolley car. All the passenger traffic, being local, is moved by electricity, while freight is hauled by steam locomotives over the same tracks at night.

"Another development that will follow the common ownership of the various agencies of transportation within a given territory will be an interchangeable steam and electric service over the same tracks. That is to say, the through steam trains carrying long distance traffic and high speed electric trains handling local traffic and affording frequent and rapid communication between neighboring cities will operate over the tracks on which steam trains now run. The result will be the realization of the chief advantages of both systems."

Other pending developments discussed by Mr. Mayo are the great extension in the utilization of electric lines as feeders to the steam systems in sparsely populated districts, the substitution of the trolley express for the way freight in handling certain classes of local business and the utilization of the "trackless trolley" combination storage battery and trolley truck, in collecting and distributing goods to and from central freight stations.

### Succesful Brake for Runaway Cars

According to the Canadian Government Trade and Commerce reports, an electro-magnetic street car brake, the invention of Mr. A. W. Maley, formerly assistant engineer of the Leeds Corporation Tramways, has been subjected to a series of important trials by the Corporation of Birmingham during the last few days. It is generally believed that the problem of braking a runaway car on dangerous gradients has been solved. The contrivance is more elaborate than the brakes at present in use on street cars, and adds about half a ton to the weight of the car. It is a combination of the principle of mechanical and electro-magnetic brakes, both being applied to the track itself and not to the cars travelling upon it.

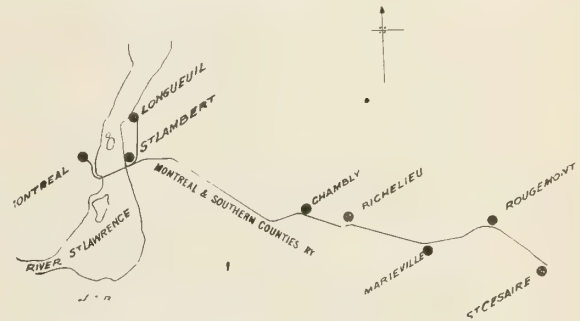
Among the many advantages claimed is the elimination of the danger of skidding, due to the fact that no braking is done on the wheels other than to drive the motors as generators, when descending a hill or making a stop. The current so generated is utilized for the track magnets, which in turn are attracted to the rail, and by their backward movement as the car goes forward throw into action mechanical rail shoes. There are three blocks on each rail, namely, a magnet and two slippers. While the brake action is thus extremely powerful, the blocks have a tendency to keep the rails clean. In addition to its electro-magnetic function the brake may be applied by hand from the driving platform, and for this purpose suitable levers and links are introduced. The magnets are excited either by the cur-

rent taken from the motors acting as generators, or, by the operation of a special canopy switch, they may be energized direct from the trolley wire.

The trials in Birmingham have been regarded as satisfactory. The most severe test to which the invention was subjected was in attempting to stop a runaway car. The car was brought down a gradient at a speed of about 27 miles an hour, and half way down the hill the brake, operated in conjunction with the motors, was applied. Rain had previously fallen, making the track greasy, yet, unaided by the application of sand to the rails, the heavy car was successfully brought to a standstill within eighty yards from the spot at which the driver commenced to apply the brake.

### A Quebec Interurban Company

The Montreal and Southern Counties Railway, a small map of whose proposed route of operations is published herewith, have a charter permitting them to operate in some sixteen counties in the province of Quebec. The area is roughly comprised by Sherbrooke in the east and Huntingdon in the west. The company propose to cross on the Victoria Jubilee bridge at Montreal, and have secured a suitable entrance into the city of Montreal.



Route of the Montreal and Southern Counties Railway.

The population of St. Lambert is about 2,500 and of Longueuil 4,000. It is expected that in the near future a large increase in the population of these places will occur, as a result of the frequent electrical service. The proposed system is 600 volts D.C. Mr. J. A. Burnett is the superintendent and electrical engineer for the company, and the officers are: S. T. Willett, president; F. D. Monk, 1st vice-president; W. B. Powell, 2nd vice-president and manager; J. W. Harris, treasurer; T. Craig, secretary.

### Control of Toronto Streets

The decision recently given by the Ontario Railway & Municipal Board, whereby the Toronto Railway Company has given rise to a great deal of criticism.

Premier Whitney, in referring to the matter, expressed his confidence in the board and its ability to interpret the law regarding the city's agreement with the company. He said further: "The judgment of the Railway and Municipal Board is devoid of all uncertainty and makes the matter quite clear. It is a definite and clear-cut decision, and in that respect is very satisfactory. It is also to be assumed that it is a correct exposition of the law in the case. The effect of the judgment is to make the situation an impossible one. Under no circumstances can any outside authority be allowed to assume control of the streets of the city—or, indeed, of any city. Our system of government is elastic enough to deal with any differences which may arise in this way, and that without doing injustice to any person or interest."



# Electric Power Development in Newfoundland

## Extensive Undertaking at Grand Falls— Power Secured from Exploits River.

An extensive power development is well under way at Grand Falls, Newfoundland, where the Anglo-Newfoundland Development Company, Limited, are building a large paper mill. This company have secured extensive areas of timber lands as well as mineral bearing territory from the Government. They have dammed the Exploits River at Grand Falls, a quarter of a mile above the falls. The total length of the dam is 2,000 feet, while water flows over a part 900 feet long. Part of this is shown in one of the illustrations. The dam is 20 feet high. The Exploits River has its source in the Red Indian Lake, into which numerous other lakes have their outlet. Among these are the Victoria, Lloyd, King George IV., Rogerson and other smaller lakes. These are situated among the Annieopsquolch Mountains, so that there is no danger of a scarcity of water.

Last summer was exceptionally dry, and the water was lower in the rivers than at any time before noted. However, at this very low water mark, the company figured that they had over 40,000 horse power. At a normal flow of water, they would have over 60,000 horse power.

Two large steel flumes, 15 feet in diameter, run from the dam to the power house, half a mile distant. These flumes are built in segments made of steel plate manufactured on the ground in the company's boiler shop. (This boiler shop is fully equipped with modern machinery, and at present, a steam engine furnishes power. However, the construction of the building is not yet completed.) The flume is laid on the solid rock bottom,



Rapids on Exploits River, Grand Falls, Newfoundland.

and they have blasted out the rock in order to get the flume beneath the surface. A little below the falls are some rapids, which are also shown in an illustration. The power house is placed near the river below these rapids. The intervening falls are 60 feet high, so that from the dam to the power house, below the rapids, there is a drop of about 120 feet. Before reaching the power house, one of the flumes branches off into two parts.

The water turbines are three in number, and are of Swiss make. They are designed so that they will give a minimum of 40,000 H.P., but at higher water, they can give nearly twice that amount of power. Each turbine is

furnished with a large gate to regulate the supply of water.

The generators are of the Westinghouse make, and are of the vertical type, direct connected to the turbines. The main building is situated about 400 yards from the power house. Over a dozen buildings comprise the plant, and all of these, including the power house, are built of reinforced concrete.

The mill machinery will all be driven by electric power, and for this purpose 75 motors have already been purchased from the Westinghouse people, the largest of



Section of Dam on Exploits River, Grand Falls, Newfoundland.

which is 300 H.P. It is expected that everything will be in operation next fall. This company is a part of the Harmsworth Corporation, whose charter is such that they can bring in all machinery for their use free of duty. This gives the American and European manufacturers an advantage over the Canadians.

Mr. G. F. Hardy, of New York, has been acting as consulting engineer for the company. The officials of the Anglo-Newfoundland Development Company, Limited, are: Mason M. Beaton, president; H. F. Lincoln, superintendent of construction; Alex Wood, treasurer; W. Scott, chief engineer, and F. S. Pook, purchasing agent.

### Government Ownership of Cables

The movement in favor of the government ownership of submarine cables received a substantial impetus at a recent meeting held at the Mansion House, London, Eng. The Lord Mayor of London presided and among those present were representatives of the various lines interested, Lord Milner, Lord Strathcona, the Earl of Jersey, the Duke of Argyle, Hon. Rodolphe Lemieux, the Canadian Postmaster-General; Sir Edward Sassoon, and a number of colonial representatives.

The speakers were unanimous on the necessity for a uniform system of cabling throughout the Empire available for the public, and Mr. Lemieux and Mr. Collins, the Agent-General of Australia, pledged their respective governments to support the proposal. Mr. Lemieux said that in Canada there was deep interest in the matter of improved facilities for communicating with the motherland, and declared that public opinion in Canada also was in favor of lower cable rates between America and the United Kingdom.



# In the Courts—Recent Interesting Cases

**The Cost of Arc Lighting.**—Judge Anglin has given his decision in the case of the city of Hamilton and the Hamilton Cataract Power Company as to the construction of an agreement between the company and the city respecting street lighting. Under the agreement it was arranged that in case the cost to the company of supplying the light should be materially reduced by new discoveries or advances in the electric art, the city might ask for a reduction in price, and failing in agreement upon such reduction, reference should be made to an arbitrator. In December, 1904, the city clerk asked for a reduction of \$25 per annum on each light, under this agreement, and the matter was referred to the County Court judge as an arbitrator. He decided that the arc lamp now in use was not a new discovery since the date of the agreement and no reduction should be made on that account. He also decided that improvements in insulation, generators, transformers, transmission line switches, lightning arresters, circuit breakers and other minor improvements had been made since 1899 whereby a material saving in the cost of power, avoiding expensive breaks, etc., could be made and therefore he awarded a reduction of \$15.50 upon each lamp, making the award retroactive to cover the period between June 21, 1905, and October 31, 1907, entitling the city to the payment of \$16,169 from the company. The company appealed from this finding, claiming that the arbitrator had no right to fix the price for lamps in the past. The city appealed from the decision relating to the arc lamps now in use. The Court of Appeal held that the arbitrator had exceeded his authority in directing a refund to be paid and that the case as to the enclosed arc lamps should be open for further evidence.

**Responsibility for Crossed Wire Accidents.**—In the case of Sutton v. Town of Dundas which recently came before the Ontario Court of Appeal, the appeal was from a judgment of Judge Teetzel dismissing the claim of the appellants for contribution against the co-defendants the Dundas Electric Company. One of the fire alarm wires of the town of Dundas had fallen across the wires of the Dundas Electric Company, which were strung beneath it. Both wires melted at the point of contact and the severed live wire fell to the sidewalk and came in contact with one Samuel Sutton, causing his death. The Court of Appeal found that according to the evidence the negligence of the appellants was the effective cause of the accident. Had the wire been properly secured the actual occurrence could not have taken place, but even assuming negligence on the part of the Dundas Electric Company in failing to properly insulate their live wires it was only rendered dangerous by the falling upon it of the fire alarm wire. The appeal therefore was dismissed.

**Damages for Death of a Linesman.**—Chief Justice Moss recently gave judgment in the case of Wright v. the Port Hope Electric Company, in which appeals were brought by both the Port Hope Electric Company and the Canadian Pacific Railway Company, from the judgment by Judge Britton in favor of the plaintiff, claiming \$2,500 damages for the death of Harry B. Wright. Wright was working as a telegraph linesman for the C.P.R., and according to the jury's finding, his death was caused by the circuit formed between the south primary wire and the south transformer hanger, which had been placed by the Electric Railway Company on the telegraph pole, the property of the railway company,

which Wright had ascended in the performance of his work. The Court decided that the appeal of the railway company should be allowed and the action against them dismissed with costs against the plaintiff, and that the appeal of the Electric Company should be dismissed with costs.

**Contributory Negligence in Street Car Accident.**—Judge Garrow recently gave judgment in the Court of Appeal for Ontario in the case of Brill v. the Toronto Railway Company which was an appeal by the defendants against judgment for \$1,150 damages in favor of Sarah Brill and \$100 in favor of Isaac Brill for injuries sustained by the former by being run down by an electric car on Yonge street, Toronto. The plaintiff had passed behind the north-bound car and had been struck by the south-bound car, causing the injuries. The jury in the trial before Judge Clute decided that the defendants were guilty of negligence and that there was no contributory negligence on the part of the plaintiff. The Court of Appeal, however, in their judgment stated that the plaintiff was guilty of contributory negligence in not having looked for the south-bound car after passing behind the north-bound car. Accordingly the appeal was allowed.

**The Hamilton Cataract Power Contract.**—Judge Anglin recently gave judgment in the case of Smith v. the City of Hamilton and the Hamilton Cataract Power, Light and Traction Company. The action was for a declaration that the by-law of the municipal corporation with the company was void, and for a judgment quashing the same and restraining both defendants from acting upon the by-law, and the agreement executed in pursuance thereof. The validity of the by-law was impugned upon several grounds. Judge Anglin stated that upon all the grounds upon which the by-law had been attacked it was unexceptionable. He found, however, that the contract made under the by-law, was only good for one year and would have to be ratified annually. He therefore dismissed the plaintiff's action without costs.

**The Closed Front Door.**—The Court of Appeal for Ontario has given judgment in the case of McGraw v. the Toronto Railway Company to the effect that the company was not negligent in not having posted upon its front door a sign to the effect that passengers should enter by the rear door. The plaintiff in this case had attempted to enter by the front door and finding it closed and without a door knob had been unable to enter. While she was standing on the steps the car started and she was thrown off, resulting in her receiving injuries. On the jury trial of the case she was awarded \$750 damages. The Divisional Court set aside this verdict and directed a new trial. The Court of Appeal has now decided that no new trial shall be granted.

**Hydro-Electric Writ Amended.**—Judgment has been given against the motion of the City of Toronto in the case of Beardmore v. the City of Toronto for an order to strike out the statement of claim and stay all proceedings until the Hydro-Electric Power Commission of Ontario should be added as a party defendant. The judgment gives the plaintiff leave to file the statement of claim as amended.

The city of Toronto will appeal from the decision of the Ontario Railway & Municipal Board, giving the Toronto Railway Company virtual control over city streets



# TELEPHONE TOPICS

## The Independent Convention

The twelfth annual convention of the International Independent Telephone Association was held recently at the Auditorium Hotel, Chicago. A report of the meeting was unavoidably omitted from the January issue. The hall on the sixth floor of the hotel, and the floor adjacent to the banquet room was occupied by the leading manufacturers and supply dealers who are seeking the trade of the independent telephone companies.

The following officers were elected for the ensuing year: President, E. H. Moulton, of Minnesota; 1st vice-president, P. C. Holdoegel, of Iowa; 2nd vice-president, E. B. Fisher, of Michigan; 3rd vice-president, Dr. J. F. DeMers, of Canada; 4th vice-president, W. J. Uhl, of



Dr. J. F. DeMers, Levis, Que.,  
Third Vice-President.

Indiana; treasurer, Mansfield Savage, of Illinois; secretary, A. C. Davis.

In his combined report as secretary and treasurer of the association, Joseph B. Ware, of Grand Rapids, Mich., read an extended paper in which he reviewed the work done by the organization since it first came into existence. In this paper Mr. Ware urged that concerted action be taken by independent telephone associations and companies for the protection of the independent movement.

The sessions were in the nature of technical and practical conferences. This was a departure from the usual custom, inasmuch as the papers read and the discussions treated of practical and engineering problems rather than of the financial problems of independent telephone companies. Reports were read from many of the independent telephone associations, in which general progress was shown during the past year. In Canada the independent movement has been very encouraging, although in the western provinces progress has been slow. It was reported that Ontario is far in the lead of the other

provinces in the matter of forming new independent companies.

Prof. Morgan Brooks, of the Illinois State University, read a paper on "Some Technical Problems." Following the presentation of this paper, which treated in part of the induction troubles that are liable to arise on telephone wires as a result of the increasing practice of installing for electric railway use high voltage, single-phase transmission lines, Professor Brooks excited greater interest by predicting that as a result of the single-phase traction lines becoming popular, great dangers are in store for telephone lines. With the growth of this method of transmitting current at high voltage it will be necessary to make laws and otherwise provide for the safety of telephones and telephone users. He brought out some very interesting points on the best method of meeting this new trouble, and a committee was appointed to make investigations and prepare reports for the benefit of all company members of the association.

In a paper on standardization of toll line construction Mr. W. J. Stanton laid emphasis upon certain points which divide proper construction from merely strong and durable building of telephone lines. One of the best points was that a man might erect a line which will weather any storm and yet turn out a job which must be rated as a poor one. The reason was that the line cost too much. In spending too much money to hold up wires, the construction foreman put an unnecessary drag on the directors' office.

Mr. Stanton's paper not only drew attention to this common fault in methods, but showed why it exists, and along what lines they must work to do away with it.

Among other papers presented to the convention were the following: "Economical Developments of Toll Territory," by Frank F. Fowle, of Chicago, Ill.; "Standardization of Certain Instruments," by Gerald Deakin, of San Francisco, Cal.; "Economies in Handling Maintenance Men," by J. H. Ainsworth, of Dayton, Ohio; "Local Traffic," by A. J. Shands, of St. Louis, Mo.; "Phantom Circuits," by C. Ewing, of Buffalo, N.Y.; "Pole Supply and Preservation," by W. F. Sherfesse, expert, United States Forest Service; "Damage Suits: Their Prevention and Defence," by Wm. S. Hart, of Waukon, Iowa.

## Dealing with Cable Troubles

In a letter to "Telephony" a correspondent gives the following experiences and suggestions regarding his troubles:

Our cable troubles are of three different classes: those caused by wires, by lightning and by change of temperature. The trouble due to trees is caused by contact with the limbs of the trees; for example, the cable may become caught in a crotch and then, when the wind blows the motion of the tree bends the cable up and down, again and again, until the whole structure of the lead sheath is changed to a crystalline mass, and, of course, these places open up and let in moisture when it rains. After the lead is taken off you can hold it up to the light and see through it in dozens of places.

This trouble only happened to the small cables, where the trees had grown up to them in the last year. Trees merely rubbing against a larger cable have never caused us any trouble. It's the constant bending that counts.



The second cause of trouble, lightning, seems to hit us wherever there is an abrupt turn in the cable, or wherever the cable touches another cable or messenger.

Cases in the third class, the temperature troubles, seemed to come wherever there was a sharp bend in the cable which had been later straightened out. Owing to the way in which our cable distributes, we were able by studying the causes of trouble to locate the various cables that were in trouble and, in most cases, to tell in what place, that is, between which junction boxes, the trouble was. This would leave three or four spans of cable to be looked over for the trouble. On the long leads we make use of the regular cable tests, applied in a somewhat modified form.

### Reducing Reflection Losses

In a discussion upon Telephony before the Engineers' Society of Western Pennsylvania recently Mr. E. B. Tuttle said that when Pupin worked out a satisfactory practical method of loading lines with inductance coils, it was found that reflection losses between loaded and non-loaded lines were very considerable, and a very expensive and complicated terminal tapering or gradual reduction of the loading at the ends was made use of to reduce the reflection loss. This was found very satisfactory from the operating standpoint, but was found to be too expensive for general use. Within the last year a specially designed transformer had been found to do this work and the work of repeating coil also, thus accomplishing the saving from reflection losses with but very slight additional cost. The design of switchboards, although nearly as perfect as is conceivable from the present operative standpoint, "will shortly give way to an entirely different type of board which will be more economical and more rapid."

Mr. L. C. Moore, speaking of glass poles, said that they are made hollow, 10.5 inches at the butt, 7.5 inches at the top, 28 feet high, and there are some 200 of them in use now on the Imperial Post lines in Germany where they are being experimented with. "They put the glass poles at the angles, where the wire took a sharp turn, and where the line ran straight there would be eight or ten wooden poles, and farther on would be glass poles again."

### Injunction Against Interference

Judge Taylor, of the United States Circuit Court, at Cleveland, Ohio, recently granted a temporary injunction against the American Telephone & Telegraph Company (Bell parent system) and the Central Union Telephone Company (Bell company operating in Ohio, Indiana and Illinois) restraining them from interfering with the business of the independent companies operating in those and adjoining states. The injunction was granted at Cleveland upon the application of officers of the United States Telephone Company, which is the independent long-distance telephone company operating in Ohio and adjoining states. The Bell company was required to disconnect its lines from the exchanges of all companies, formerly its competitors, with which it had merged, and to refrain from making such connections in future.

As accurately as can be estimated, the number of telephones in use to-day is about 9,500,000, a little over 7,000,000 of which are in the United States, 2,000,000 in Europe and the remainder in all the other parts of the world. Such figures, however, can not be taken as absolutely reliable.

The rapid strides with which the telephone is be-

coming more and more indispensable to mankind is borne out by the statement that the Bell companies recorded an average of 18,624,000 calls a day during 1907, which would be about 75 calls for every man, woman and child in the United States for the year.

## General Telephone News

The first of the Saskatchewan local telephone companies organized under the new government regulations is now in operation at Maple Creek, under the name of the Maple Creek Telephone Company. The rates charged are \$2 and \$1.25 per month respectively for business and residence telephones.

At a recent special meeting of the Town Council of East Toronto the telephone question was discussed, and assurance given that an independent service would be given to connect with the Scarboro system. The Scarboro company operates 50 miles, with 200 subscribers, and will now have free communication with East Toronto.

The Nova Scotia Telephone Company is finding that in many parts of its territory maintenance charges are running high on account of the fact that glass insulators have been used on toll lines, and are found to break easily. From now on, glass insulators will be confined to town construction, and porcelain insulators only will be used on long distance line, or any other long line where the liabilities are the same.

The Farmers' Long Distance Telephone Company of Blenheim, Ont., which has recently been formed, will confine their operations to East and West Kent for the present. The officers of the company are: Neil Watson, Mull, Ont., President; James Rutherford, Blenheim, vice-president; H. W. Edmunds, Blenheim, secretary; Dougald McCaig, Mull; John Whittington, Mull, and A. Hufffman, Fargo, directors; M. H. Newcomb, Blenheim, manager. The president, Mr. Neil Watson, has given much attention to the matter of telephone companies recently. He has been constructing lines for about a year, with long distance connections with the Bell Company. The Rutherford, Story & Edmunds Company, of Blenheim, joined with Mr. Watson in the formation of the new company, which is a joint stock company.

### Rates Unchanged at West Toronto

Mr. Kenneth Dunstan, manager of the Bell Telephone Company at Toronto, says that the telephone rates will not be affected by the annexation of West Toronto or any other suburb. West Toronto is the only one of the five suburban communities which has a local exchange. If the two cities are united the rates will remain the same, viz.: Local service in West Toronto, business 'phone, \$30; residence 'phone, \$25; Toronto calls, each 5 cents.

Combined rate, West Toronto and Toronto: Business, \$80; residence, \$40.

City of Toronto service only: Business, \$50; residence, \$30.

With the four municipalities, East Toronto, Deer Park, Bracondale and Wychwood, which have no branch exchanges, the charges are estimated on the Toronto rate plus mileage.

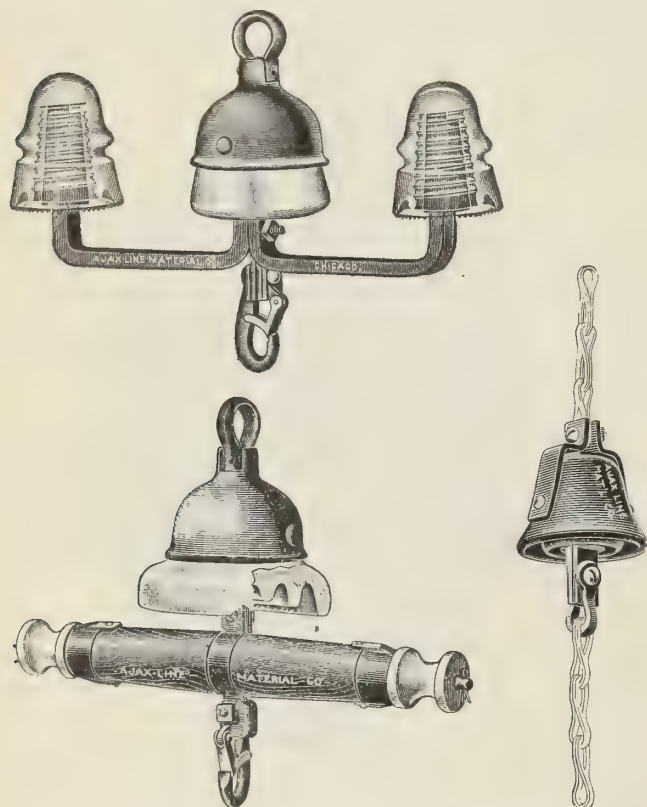


# Letters to The Editor

## Suspension of Arc Lamps.

Editor of the "Electrical News":

Answering the question propounded by X. Y. Z. in the January issue of "The Canadian Electrical News," the same problem has confronted hundreds of electric light plants in the States, where galvanized steel chains are being rapidly introduced for hoisting arc lamps. Here, as in the Dominion, the added risk has been ignored by most plants, but gradually one after another is waking up. Now the situation is being met in two ways: One consists in inserting an insulator in the chain just



Devices for Suspending Arc Lamps.

high enough above the fastening to be out of accidental reach on the part of the pedestrian. This insulates the part of the chain liable to be touched by an outsider, and seems the cheapest way of reducing the risk.

However, both the line wires and the frame of the arc lamp need to be thoroughly insulated from the supporting strand or mast-arm and from the chain. Each suspension therefore demands an insulating cross-arm over the lamp, and many prominent central station managers believe in depending entirely on such a cross-arm for the insulation. Two types now being used for this purpose are pictured herewith, each having a main insulator ample for service at 12,000 volts. One type has the line wires supported by petticoat glass insulators secured to a channel steel cross-arm. The other has a wooden arm carrying porcelain knobs for the line wires, but has the main insulator provided with a triple petticoat so as to increase the surface insulation. With such cross-arms over the lamp, the hook or lock to which the chain is fastened can be grounded to guard against accidents.

Then it is also common practice here in the States

to insert one or two "Wire Spreaders" in the swinging wire loops to which your correspondent refers, so as to keep them from tangling and blowing against the suspension.

Yours, etc.,

Albert Scheible, Chicago.

## "Live Wire" Thinks Danger is Slight

Editor of the "Electrical News":

Referring to correspondence in your journal from X. Y. Z., re "Grounding of Secondaries," I would like to ask X. Y. Z. or other readers of the journal what percentage of accidents result from the causes named? I think if the statistics are consulted you will find no cases recorded resulting from ungrounded secondaries or chains used for suspending arc lamps.

It seems to me that a lot of this talk re grounding of secondaries is uncalled for, it has been discussed freely for the last ten years, and during that time not two persons have been injured from the ungrounding of secondaries. I have had considerable experience in this connection and have never yet had the least trouble with secondaries of transformers getting grounded on primaries. If good insulation is used between the coils there is not one chance in a thousand of grounding. If operating companies would pay more attention to testing their transformers for grounds, etc., and use a good grade of oil in them it would be time and money well spent—better than buying any old transformer and oil and then taking up the time of conventions and the pages of electrical journals talking about the grounding of secondaries. The question is getting stale, and for my part I wish the whole question would end in the ground, and that soon.

"Live Wire."

## The Tungsten Lamp Situation

That Tungsten lamps are being pushed on the market a little too enthusiastically, is the claim made in a letter to the "Electrical News." The points raised will stand some consideration and the editor would be pleased to receive the views of others upon the subject. The letter is as follows:

Editor of the "Electrical News"—

The way jobbers and manufacturers are treating the public on the Tungsten lamp question is really too bad. The former assure the public that the lamps can be burned equally well and will give the same satisfaction in any position. They well know that they can not. Also they say that each lamp will burn 1,000 hours, some going so far as to guarantee this absurd statement. They claim also that the lamps are exactly one watt per candle-power, whereas, reckoned on the British standard, to which we are accustomed here, they are actually (at the best)  $1\frac{1}{4}$  watts per candle-power, and on the Hefner or European standard of candle-power they will run 1 1-10 watts per candle-power.

As a matter of fact, the wattage seldom comes down to these figures, which are the figures claimed. The Hefner standard of candle-power is nearly one-third less than the British standard, therefore when the public are buying a 100 c.p. lamp (European) they are not getting anything like the light expected. A tungsten lamp



will burn on an angle, but what will its life in that position be? The tungsten loops are suspended on the anchors in short time, and all vibration tends to saw the tungsten filament through on the anchors. The life will certainly be very materially reduced. The use of an angle adapter is imperative to get any reasonable life on bracket work.

As to the manufacturers and their agents, why do they state that they can give immediate shipments, etc., when they know they are not able to do any such thing. There is no company manufacturing them in Canada at this date, and their parent companies in the United States have so many local orders that they are not worrying about filling any for Canada. The agents for European factories are in the same box. Why create a demand for goods that cannot be supplied, and why advise their use in the least expedient manner?

At the Madison Square Electrical Show in New York last fall the tungsten lamp made by a prominent company was exhibited in an angle position and thus was an utter failure. The attendant was kept busy renewing lamps on these sockets owing to the tungsten loops drooping down and short circuiting, whereas those in their proper pendant position were doing first rate.

The proper method of burning tungstens is in a pendant position only, preferably suspended on a few inches of cord, and absolutely controlled from a switch (not key socket). They have been known when in rigid fixtures, even in proper position and controlled by switch, to be broken owing to vibration caused in the ceiling from the room overhead, for this reason "preferably suspended on cord," which takes up a good deal of this vibration, is recommended.

There is a good thing in tungsten lamps and they fill a long felt want in their proper sphere, but the Barnum business should be stopped right now, or the public will certainly get tired before the tungsten lamp has had a proper innings.

"Dealer."

## Westinghouse Company in Stockholders Hands

The Westinghouse Electric & Manufacturing Company has again become the property of the stockholders, after having been in the hands of receivers since the 23rd of October, 1907. During the year which the receivers were in charge they succeeded in paying off the interest on bonds, as it fell due, and kept the factories of the company in operation, doing an excellent business at a net profit of over \$1,000,000. Five thousand employees of the company subscribed for \$600,000 of the stock, a fact which demonstrated their confidence in the company. Under the reorganization the company will be in a better condition than before and will start with cash on hand amounting to upwards of \$15,000,000, with an indebtedness of only about \$200,000.

The Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., have issued a new circular, No. 1157, relating to their type "S" distributing transformers, single phase. These transformers are built in 15 sizes for one to 50 k.w. inclusive. They are designed for supplying 110 and 220-volt service primary circuits of nominal 1100 and 2200 volts.

It is stated that the construction of the electrical sampling plant at Latchford, Ont., will be undertaken at once, and that the smelter will be built in the spring. The people behind the project are mainly Boston and Buffalo capitalists. The investment will amount to \$200,000.

## An Interesting Test of Dry Batteries

Electrical Specialties Limited, Toronto, have had an interesting test made of their X cell dry batteries. The test shows the comparative life of the X cell ignitors when connected in series and different series-multiple groups and used in ignition work for internal combustion engines. Three tests were made, in the first of which the ignitors were connected in one set of four in series. In the second test they were connected in two sets of four in series-multiple, and in the third test they were connected in three sets of four in series-multiple. The relative cost of the ignitors is shown by the following figures:

Test.	Cell Connections.	Service in Miles.	Relative Cost.	Cost per 100 Miles. at Retail Price.
1—	4 cells in series . . . . .	450	100%	20.5 cents
2—	8 cells in series-multiples	1,550	57%	11.8 cents
3—	12 cells in series-multiples	2,700	50%	10.2 cents

The test was made in regular automobile service, the size of the ignitors being  $2\frac{1}{2} \times 6$  inches and the operation being continuous until the engine began to miss fire. The test shows that 12 cells connected in series-multiple cost only 50 per cent. of four cells connected in series for any given distance.

## The Best Load for Central Stations

An interesting point made by Mr. H. G. Stott, chief engineer of the Interborough Rapid Transit System of New York, in his address before the Toronto section A.I.E.E. at their last meeting, was that the lighting load carried after the peak is passed, is the best for increas-



A Handsome Panel Sign.

ing the dividends of the central station. Up-to-date central stations realize that the electric sign is the best means for securing this load and are, therefore, placing special agents on the road to look after this phase of their business.

The Toronto Electric Light Company is one of the most progressive in this line, and the accompanying illustration shows the handsome panel sign recently erected on the front of their building. This sign is 12 feet 6 inches wide and 11 feet deep. It was designed and built by Messrs. Death & Watson, a firm of electrical engineers and contractors, who make a specialty of illumination and the manufacture of electric signs. Their advertisement appears on page 8

The Eck Dynamo & Motor Company, Belleville, N.J., have issued Bulletin No. 47, relating to their motor generators. The bulletin gives much information regarding these products, and will be of interest to all dealers in supplies.

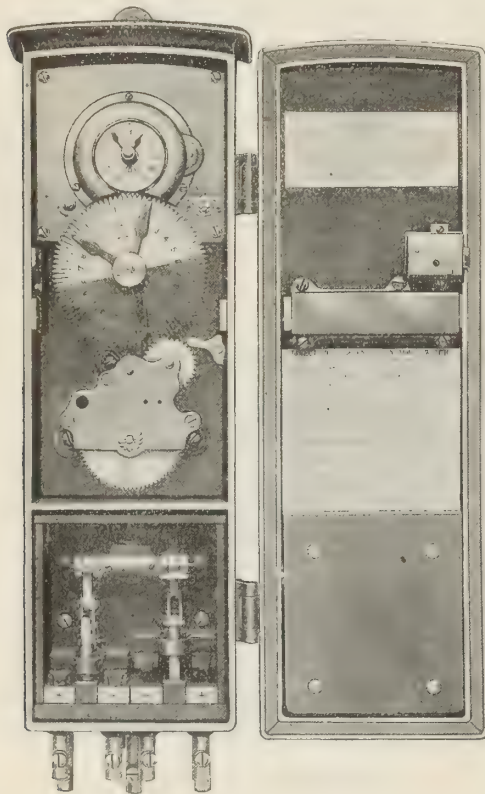


## A New Time Switch

Automatic time switches are of interest to all users of current for the reason that they make possible the control of electric current without personal attention. It may be said as a rule that a time switch can be used to advantage in all cases where a circuit has to be opened and closed at definite times and at points where there is no reliable person stationed to do this work. Great economies may often be effected by the use of the time switch in place of a device requiring personal attention.

It is comparatively easy to arrange an ordinary alarm clock so that the spring of the alarm will release a lever and cause other operating mechanism to open or close some form of friction switch, but such make-shifts are not reliable at best, and even though they may be induced to operate well when first installed, they are sure to fail when the contacts become dry or sticky, or when the temperature changes come into play.

The time switch in such a device will surely give



The A. & J. M. Anderson Time Switch.

trouble as it is called upon to do work for which it was not constructed. The demand for a switch that can be depended upon to do its work, and to do it at the time it should be done, is increasing year by year, and the economy that can be obtained from its use becomes more and more evident.

Messrs. A. & J. M. Anderson have produced an automatic time switch that is reliable and durable. That they have succeeded in doing this can be readily seen by any practical person who examines an Anderson automatic time switch, of which there are some thousands now in service. This time switch has a specially made clock, designed and manufactured in the same factory as the switches. It is of the lever type, jewelled and with a split balance to compensate for the changes in temperature.

The Anderson switch mechanism consists of two pivoted arms carrying laminated contacts and arcing contacts after the fashion of approved circuit-breaker con-

struction. These arms are separated by a toggle motion, the central joint of which is thrust upward and downward by the propelling mechanism. When thrust downward, the toggle motion is dead-centred, and it is impossible to force the laminations from their contact seats without exerting pressure sufficient to destroy the mechanism. No partial or imperfect contact is possible.

The contact mechanism is housed in a slate or porcelain enclosure in a separate compartment of the box, and is fireproof. The lower or entering contacts are each separated from the jaws of the switch a distance of over an inch when the switch is open. The circuit is opened horizontally instead of vertically, thereby minimizing the chance of maintaining an arc. If the centre joint in the toggle is forced upward and downward with precision, certainty of action is assured.

The switch is illustrated herewith. It is made in various types suitable for all conditions of service, from low voltage two and three-wire, both single throw and double throw, up to high voltage switches which are operated under oil. The company's bulletin No. 22, gives more complete information upon the subject.

A. H. W. Joyner, of Toronto, is the sole Canadian selling agent for Messrs. A. & J. M. Anderson.

## Unique Adjustable Socket Clusters

The Benjamin adjustable socket clusters, which are illustrated herewith, are designed for use with ceiling or pendant dome fixtures, stand lamps in dining rooms, reading rooms, etc., where it is desirable to adjust and



Benjamin Adjustable Socket Clusters.

fix the lights in special relation to the sides of the dome reflector. The socket may be turned to any position between two points 180 degrees apart, and locked by means of a screw. By removing the socket cap, easy access is gained to the bend screws. They are, therefore, easily wired. The cluster shown on the left is National Electrical Code Standard.

## Board Fixes Rates for Red Deer, Alta.

The board of arbitrators recently appointed at Red Deer, Alta., has fixed the rates for telephone, electric light and street lights to be charged by the Western General Electric Company. This company have a 25-year franchise, which they obtained four years ago, and which fixed the rates. A clause in the franchise reads as follows: "The rates may be changed from time to time upon application of either the town of Red Deer or the Western General Electric Company, but in no case shall the rates be greater than those charged elsewhere for similar service under similar conditions."

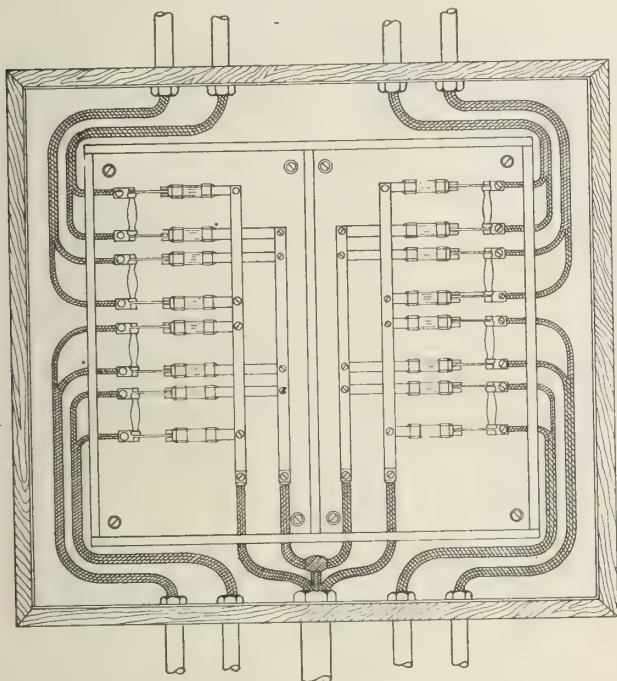
The Board of Arbitrators consisted of Mr. R. S. Kelsch, consulting engineer, Montreal, appointed by the Western General Electric Company; William Cousins, Mayor of Medicine Hat, appointed by the town of Red Deer, and Judge Roland Winters, of Lethbridge, Alta.,



appointed by the court. The finding of the arbitrators fixed the prices as follows: Incandescent lighting, etc., 20c. per k.w.hr. (with discount ranging from 5 to 20 per cent.); 6 amp. arc lights, all-night schedule, \$125 per annum; residence telephones, \$23 per annum; business telephones, \$35 per annum. The following are the former prices charged: 16 c.p. incandescent lamps, 65c. per lamp per annum; arc lamps, \$75 per lamp per annum; residence telephones, \$10 per annum; business telephones, \$18 per annum.

### The Arrangement of 240-480 Volt Panels

The electrical department of the Canadian Fire Underwriters' Association have issued a revision of bulletin No. 9, on the arrangement of 240-480 volt panels. The bulletin contains the accompanying illustration. The chief departure from the former method of installation is that the three-wire main is divided as shown, so that only the 240 volt side of the circuit will enter any one cabinet. The method illustrated hereon generally illustrates the idea. This is strictly in accordance with the



National Code, and will be positively required in all buildings where this voltage is being called for.

This arrangement is covered under Rule 24 (a) of the Code, which reads as follows: "Must be so arranged that under no circumstances will there be a difference of potential of over 300 volts between any bare metal parts in any distributing switch or cut-out cabinet, or equivalent centre of distribution."

### To do Away with an Old Evil

It is understood that at the next session of Parliament a bill will be introduced by the Canadian Manufacturers' Association making it an offence to offer an employee or for an employee to accept a gift or a consideration of any kind as a reward for showing or refusing to show favor or disfavor to any person in connection with the affairs or business of the employer. Abuses of this kind have become very frequent in connection with the sale of goods, and in view of the recent disclosures in the Marine Department it is believed that the introduction of this legislation will be regarded as very timely.

### Publications and Bulletins

"Operating Rules and Regulations for Local and Long Distance Telephone Operators" is the title of a pamphlet written by T. Anne Barnes and published by the Western Telephone Journal Company, Vinton, Iowa, U.S.A. The book gives the results of a careful study of the operating rules from leading offices in the world and should therefore be of much use to all operating rooms. It has the great merits of brevity, conciseness and good classification.

The Department of Mechanical Engineering of the University of Tennessee has issued a revised edition of its manual for engineers. This little book is a constant pocket companion for many thousand engineers, as fifty thousand copies have been published. The last edition contains new and valuable matter, particularly a very concisely arranged four-place logarithm table. For a great deal of engineering work this table is just as satisfactory as a cumbersome one of six or more pages.

H. C. Cushing, Jr., 220 Broadway, New York, has published the 15th annual edition of "Standard Wiring" for electric light and power, as adopted by the Fire Underwriters of the United States. The book contains the national electric code, explained and illustrated, and the necessary tables and formulæ for outside and inside wiring and construction for all systems. This book has come to fill a regular place in the library of all electrical engineers. It contains in extremely available form a great quantity of useful information and is so well prepared and illustrated that its usefulness is greatly enhanced. The book is bound in a substantial leather cover, and is of a useful pocket-book size.

An attractive booklet upon the P-M Remote Control Switch has been issued by the Pettingell-Andrews Company, Boston, Mass. The booklet describes the many advantages of the P-M Remote Control Switch, among them being that it simplifies wiring; saves money in installation; enables the owner to positively cut off the entire current by merely pressing a flush push button; prevents waste of current from lights which have been left burning by mistake; enables a watchman to control a show window and makes possible the control of current distribution from distant points. The booklet contains a number of practical illustrations and the cover is handsomely embossed with a design of the switch.

The Canadian Westinghouse Co., Ltd., Hamilton, Ont., have supplied us with three new circulars, Nos. 1017, 1068 and 1155. Circular 1017 refers to the company's potential regulators, of which the two principal types are the "Induction" and the "Step by step." Circular 1068 describes the Westinghouse direct current motors, types S and SA, constant, variable and adjustable speed, which are built especially for general power purposes, and have stood the test of practical service. Circular 1155 describes the company's mercury rectifier arc lighting system. The company have also issued an attractive pamphlet upon "Warrantable Expenses for Meter Testing," which is a reprint of a paper read before the Northeastern Electrical Association at Chicago, and is illustrated with cuts of the Westinghouse portable and precision meters pertaining to the testing department. The Westinghouse Co., of Pittsburgh, Pa., have furnished us with an advance copy of their circular No. 1118, describing "Type CCL poly-phase Induction Motors," for which they claim that they are economical in performance, easy of control, convenient and cleanly.



# Current News and Notes

## Belleville, Ont.

The Interurban Railway have made an application to the Provincial Government for an extension of time for the commencement and completion of their projected lines in this district.

## Brandon, Man.

A street car service will probably be inaugurated in this city during the present year. A local man has expressed his intention of seeking a franchise for the building of a belt line system.

## Brantford, Ont.

Arrangements are being made by the Lyons Electric Company to install a storage battery in its plant. Later on the company expects to duplicate its plant.

It is announced here by the management of the Grand Valley radial road that the proposed line to Port Dover will be rushed to completion next summer, along with extensions to the city lines, for the carrying out of which the company has provided a guarantee to the city of \$25,000.

The City Council has passed a bylaw allowing the Brantford Street Railway an extension of time in which to fulfil its former agreement with the city, its franchise, granted a year ago, to be sustained on condition that the agreements stated in the previous bylaw and somewhat amended be carried out. The company is to give the city, within two months, a bond for \$25,000 as a guarantee that the agreement will be adhered to.

## Cornwall, Ont.

Application will be made for the incorporation of the Eastern Electric Railway Company, for the construction of a line from this town to Toronto, passing through the townships of Cornwall, Osnabrook, Williamsburg, Matilda, Edwardsburg, Augusta, Elizabethtown, Yonge, Escott, etc.; also from a point in or near Ottawa to a point in or near the city of Brockville and connecting with the above line. Authority is asked for the issue of bonds to the extent of \$25,000 per mile.

## Calgary, Alta.

Mayor Jamieson and City Commissioners Clarke and Graves have been investigating the cost of the installation of an electric street railway with C. E. Taylor, Superintendent of the Edmonton Street Railway, and C. S. Wright, of the Preston Car Company, Preston, Ont. It is stated that the citizens would have to vote an additional \$100,000 to secure the system.

## Edmonton, Alta.

An important power scheme is now being considered by the city. It is proposed to use the water power at Grand Rapids on the Athabasca river, 150 miles northwest of the city, to generate electricity for the use of the city. At Grand Rapids there is a fall in the water of 140 feet in a distance of 600 feet, where the engineers figure that they could obtain electric power to the extent of 250,000 horse-power, which would meet the needs of Edmonton, Strathcona, Fort Saskatchewan, Leduc, Wetaskiwin and other towns. At the present time the above mentioned towns use 15,000 h.p. It is estimated that it would cost \$1,500 a mile to build a conducting line for the 150 miles.

## Fernie, B. C.

Tenders were received by G. H. Boulton, City Treasurer, until January 22nd for the purchase of \$50,000 five per cent. 20-year electric light debentures.

## Fort William, Ont.

The city is asking the Provincial Legislature to sanction a debenture by-law for \$170,000 for the extension of the street railway system.

## Freelton, Ont.

Malcolm McPherson, of this place, has been appointed by John Patterson, of Hamilton, to buy the right-of-way from Freelton to Guelph for the projected electric road of the Hamilton and Guelph Railway, of which Mr. Patterson is the promoter.

## Galt, Ont.

The ratepayers have approved a by-law to raise \$12,000 for electric light extensions.

## Hamilton, Ont.

The construction of the Hamilton, Waterloo and Guelph Electric Railway will be proceeded with at the earliest possible date. The right of way from Rockton to Galt is about completed and it is expected that the whole right of way will be settled in about two months.

## Halifax, N.S.

Application will be made for the incorporation of the Trinidad Telephone Company, Limited, to manufacture and sell in Canada telephones and electrical instruments and appliances, and to carry on a telephone and telegraph business in Trinidad and elsewhere in the West Indies.

The Halifax County Council have decided to guarantee the bonds of the Halifax and Suburban Electric Company, Limited, to the amount of half a million dollars. It is stated that parties interested in the Waverley Gold Mine are ready to furnish the capital for utilizing the Fall river water power and transmitting to Halifax, via Dartmouth and Bedford, for manufacturing and other purposes.

## Lethbridge, Alta.

Smith, Kerry & Chace, engineers, Confederation Life Building, Toronto, Ont., state that the city will expend about \$100,000 for a steam power plant to be built on the Belly River at Lethbridge. The city owns a plant which it purchased from a local company. The new station will have mechanical stoking, fuel economizers, surface condensers, and will include 450 kw. old machinery, 500 kw. new; a 2,000,000 gallon steam or electric pump and space for 500 kw. additional electrical machinery. The plans and specifications are ready. The plant will supply light and power to the town.

## Lancaster Township, Ont.

Application will be made at the next session of the legislature for the incorporation of the Eastern Ontario Counties Electric Belt Line Railway Company for the construction of a line from this township to the city of Ottawa, connecting with the Lanark Electric Railway, and a branch line from Kenmore to Russell. Power is asked to enter into an agreement with the Cornwall Electric Street Railway Company for amalgamation with that concern for bonding purposes to the extent of \$20,000 per mile.

## Moose Jaw, Sask.

A rural telephone company is being organized at Postville, northwest of the city. The principal subscribers are J. A. Maharg, N. E. Harris, J. A. Sheppard, M.L.A., Hugh Lake, Arthur Rathwell, and S. K. Kathwell.

## Moncton, N. B.

The city will apply for legislation to authorize them to construct and operate an electric street railway in Moncton, and in the parishes of Moncton and Shediac.

## Montreal, Que.

The Saraguay Electric & Water Company, of which Chas. Brandeis, C. E., of Montreal, is engineer, are calling for tenders for transmission line, extending from the power house to Point aux Trembles, a distance of about 17 miles. The work will be commenced early this spring.

## Morrisburg, Ont.

The Morrisburg Electric Railway are applying for an amendment to authorize the construction of an extension of the main line from Ormond to Ottawa, passing through Ormond, Metcalfe and Greeley.

## Niagara Falls, Ont.

The Ontario Power Company are preparing plans for the construction of a new pipe line to increase their capacity of electric power by 65,000 horse power. The work will be commenced early in the spring. The work is made necessary to handle the contract with the Hydro-Electric Commission. The tunnel will be of steel, lined with concrete and will be 30 feet in diameter and between three quarters and one mile in length. The work will cost over three-quarters of a million dollars. With the new line the company will be able to develop 180,000 horse power.

McKenzie & Mann interests are about to begin the development of their right of way for a railway between Niagara Falls and Toronto, and have also begun preliminary work on a bridge across the Niagara river. Engineers have begun work surveying on the American side of the river for the approach of the bridge, which will cross the river just north of Niagara street. Mackenzie & Mann interests now own a right of way for a power transmission line, and the land secured is sufficiently wide to permit the construction of a double track railway from Toronto to this city. The engineers state that the work of preparing the plans will be hurried through, and it is thought that the work of construction will begin early in the spring. From Mr. Thomas Penny, President of the International Street Railway Company, it is learned that this work is the beginning of the trans-Niagara bridge project, and that it is in no way connected with the International Street Railway.

## Orillia, Ont.

The Oro Telephone Company are planning considerable extensions. It is proposed to build a line from Coulton and Jarratt to Price's Corner and thence to Orillia, etc. In the meantime the Oro line will be extended into Orillia by the Barrie road.

## Ormstown, Que.

In a recent fire at Walsh's Mills the local electric light plant was destroyed and the town left without lighting.



**Ottawa, Ont.**

The Ontario & Michigan Power Company will seek incorporation to acquire and operate water power on the Pigeon river and the Nepigon river, for the construction of necessary buildings and for the building of electrical and hydraulic works.

The chief engineers of the Public Works, Marine and Canals Departments, who were asked by the Government to report on the project of an American company to develop power on the St. Lawrence river, near Cornwall, by damming the Long Sault Rapids, have reported that the plans as submitted by the company would need considerable modification before they could be entertained by the Canadian Government. The report states that the privileges asked for should not be granted unless it is made absolutely sure that the project will involve no interference with navigation, and the present canal system. The company have secured rights on the New York side of the river.

A meeting was held recently in connection with the project of a belt line of electric railway connecting the principal towns and villages of the central Ottawa valley and the St. Lawrence front. A charter for a part of the projected line is already in existence and it was decided to take steps to secure authority to construct the remainder. The line would connect Ottawa with Arnprior, Renfrew and towns up the line, then go to Brockville and down the St. Lawrence and back to Ottawa. The extent of the line would be about 200 miles.

Application will be made at the next session of parliament for the incorporation of the Ontario and Michigan Power Company for the development of power on the Pigeon river and Nepigon river, etc.

**Port Arthur, Ont.**

The by-law to raise \$25,000 for further power development of the Current river was carried.

**Sydney, C.B.**

The East Bay Tramway Company are asking the Cape Breton County Council for financial assistance in the construction of a line of electric railway which they propose building from this city to East Bay.

**Saskatoon, Sask.**

The North-Western Telephone Company have issued a block of \$25,000 stock and are planning considerable construction.

**Sydney, N. S.**

The Sydney-East Bay Electric Railway will make application to the County for several concessions for the construction of their proposed road.

N. J. McLean, of Fourchu, has commenced the survey for an electric road to East Bay.

**Sherbrooke, Que.**

The main switchboard, distributing boards and cabinets for the new drill hall at Sherbrooke, Que., are being supplied by the Hill Electric Manufacturing Company, Montreal.

**St. Lambert, Que.**

The Town Council has passed the bylaw granting a franchise to the Montreal & Southern Counties Railway through St. Lambert across the Victoria bridge and into the city of Montreal, making its terminus at the foot of McGill street.

**Saskatoon, Sask.**

Tenders are invited until February 3rd by J. H. Trusdale, City Clerk, for 500 h.p.

boilers in two or three units. Plans and specifications may be seen at office of Electrical Superintendent.

**Toronto, Ont.**

A deputation representing Brantford, Galt and other towns on the Grand river waited upon Hon. Dr. Reaume, Minister of Public Works recently to ask for provincial aid in making surveys for dams on the river. The cost of the work, it is believed by the Government engineers, would be considerable and four dams might be required. The delegation was headed by Mr. Brewster, M.P.P., Major Craig, M.P.P., and George Pattinson, M.P.P.

Hon. Adam Beck was recently in the city and stated that the extension of the contract with Mr. F. H. McGuigan will be at once considered and a new line from London to Windsor probably determined upon. The present plans call for 293 miles and the extension would be 128 miles, a total of 421 miles.

**Vernon, B. C.**

The City Council have decided to spend \$25,000 on the B. X. Creek water supply. Reports were received from John Galt, C.E., and Meredith & Tracy. The reports estimated the Long Lake scheme would cost \$96,000, but this scheme, besides supplying water for \$5,000, would furnish 300 to 500 horse power.

**Victoria, B.C.**

Application will be made for the incorporation of the Victoria & Barclay Sound Railway Company for the construction of a line from Victoria by way of Otter Point and San Juan to a point on Barclay Sound, near Sarita river, for the construction of telegraph and telephone lines along such railway, and for the acquisition of electric or other power or energy and the transmittance of same to any place in the municipalities through which the railway is to be built. W. H. Langley is solicitor for the company.

**Vancouver, B. C.**

Honeyman & Curtis, architects, this city, have prepared plans for the erection of the Canadian General Electric Company's new building to be built on Pender street west at a cost of \$70,000. The Canadian General Electric Company, Peterboro, Ont., may be addressed.

James D. Schuyler, Union Trust Building, Los Angeles, has advised the British Columbia Electric Railway Company to undertake at the mouth of Lake Coquitlam the construction of a dam 75 feet high. This will create an increased supply, which will flow through the hydraulic tunnel to Lake Buntzen, there being delivered to the pipes which carry it to the generating station on the North Arm of the inlet. This scheme is being laid before the provincial government. R. H. Sperling, Vancouver, is general manager.

Work has commenced upon the remodeling of the Sam Kee block on Carrall street, which will be occupied by the British Columbia Electric Railway Company during the demolition of their old quarters and the reconstruction of a \$200,000 tram depot and office building.

With the pooling of the interests of the Stave Lake Power Company, the Vancouver, Westminster & Yukon Railway and the Burrard, Westminster, Boundary Railway & Navigation Company, eastern United States capital—reported to be closely allied to the Standard Oil—is said to be prepared to expend the sum of \$5,000,000 in developing the Stave Lake power scheme, building the steel bridge across the Second narrows

of Burrard Inlet for the V., W. & Y. Railway, and constructing electric railway lines radiating from Vancouver, north and east and south to the boundary line.

During the past year the Stave Lake Power Company has purchased 14,000 acres of land in the watershed at Stave Lake, and when the dam at the falls is completed the company will have a reservoir 27 miles long by an average of between five and six miles in width, affording plenty of waterpower even during dry periods. The Federal Government has voted the V., W. & Y. Railway Company a subsidy of \$200,000. It is estimated the bridge across the Second Narrows will not cost more than twice this amount.

**Woodstock, Ont.**

The People's Railway Company are applying for incorporation to construct a road from this city to Arthur by way of New Hamburg, Berlin, Fergus and Elora. Bonding powers to the extent of \$20,000 a mile are asked.

**Welland, Ont.**

Geo. H. Bugar is endeavoring to secure a franchise for an electric railway. The aim is to provide a local service from the county town to the lake front. The first part of the line will be built from the Grand Trunk to the Michigan Central, the second section from the Michigan Central to the Air Line, and the third from Air Line to Port Colborne. The company hope to get the first two sections in operation early this year, and the third before the opening of 1910.

**Wellandport, Ont.**

James A. Ross, president of the Dunnville, Wellandport & Beamsville Electric Railway, states that plans have been made to begin construction this spring. The road will extend from Dunnville through Wellandport to Beamsville, a distance of 23 miles. A bylaw has been recently passed by Dunnville granting a bonus of \$15,000. It is possible that the board of directors will be reorganized shortly. Capital stock, \$400,000. The road will be bonded at \$20,000 per mile. Officers: James A. Ross, Wellandport, president; W. J. Aikens, Dunnville, secretary; R. T. Gough, Toronto, chief engineer.

**Wolseley, Sask.**

The ratepayers voted on January 30th on a proposal to issue \$18,000 five and a half per cent. 15-year debentures as a loan to the Central Light & Power Company. J. A. Hill, Secretary-Treasurer.

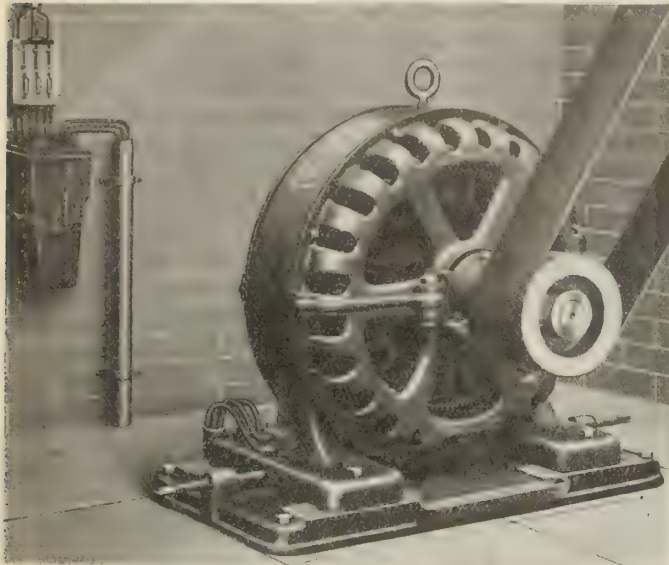
Montrealers have invested heavily in Central Georgia Power Company bonds. This company is building a plant 40 miles from Atlanta, Georgia, and 40 miles from Macoun, Ga. The power plant will be located on the Ocmulgee river and operate under 100 foot head. Mr. R. S. Kelsch, consulting engineer, Montreal, has closed a contract between the Central Georgia Power Company and the Macon Railway, Light & Power Company for 500 h.p. at \$30 per h.p. per annum on a flat rate basis.

In the arbitration proceedings between the Shawinigan Water & Power Company and the mine owners of Thetford Mines, to determine certain matters in connection with the power contracts, the award was made in full in favor of the Shawinigan Company. Mr. M. A. Sammett, of Montreal, acted for the mine owners; Mr. R. S. Kelsch for the Shawinigan Company, and Mr. J. M. Robertson, consulting engineer, Montreal, was the third arbitrator.



### Polyphase Induction Motors

Polyphase induction motors of the squirrel cage type offer advantages for many installations superior to those of any other type of motor. Absolute freedom from



Westinghouse Type CCL Motor.

sparkling is assured, as there are no sliding contacts and hence there is no wear except in the bearings. Simplicity of construction and operation, and low cost for attendance are among the marked advantages of this type of motor. The Westinghouse Electric & Manufacturing Company supplies a type CCL motor which embodies

all the advantages inherent in this type of alternating current motors. This line includes motors from  $\frac{1}{2}$  to 200 horse-power for 25 and 60 cycles, as well as from 1 to 75 horse-power for 40 cycles. The motors are wound for standard voltages.

In a CCL motor the stationary primary consists of a frame with two removable bearing brackets and bearings, and a core on which the primary is wound. The rotating secondary consists of a core with conductors, a spider and a shaft. Both cores are built up of circular sheet steel laminations punched from thin plates. These sheets are securely held in place by stiff end plates or end rings, which prevent all vibration of the laminations and hence any wear of the insulation on the windings. In nearly all cores partially closed slots are used.

Care is taken to provide for ventilation of both stationary and rotating parts, so that the motors are able to operate with heavy loads. The clearance between the moving and stationary elements is sufficient to allow a long life of the bearings before rubbing can decay between the two parts; but at the same time the accuracy of the machine work on the cores is so high that the clearance has been brought low enough to obtain good efficiency and operating conditions. The bearings and the shafts are liberally proportioned, so that the severest service may be withstood; at the same time facilities for repairs are also provided.

While the standard motor is designed to be belt connected, the use of back gears or direct connection is also provided for. In order to supply a convenient method of driving certain types of machines, such as vertical shaft centrifugal pumps, the CCL mounting is so modified that the shaft runs vertically, a ball bearing taking the weight of the motor.

The operating characteristics of the motor are excep-

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tionally good. The slip at full load varies from 7 per cent. in the smallest sizes to 3 per cent. in the larger sizes. The maximum running torque is from 2 to  $2\frac{3}{4}$  times the full load torque, which fits the motor for service involving sudden and heavy overloads. The efficiency is very nearly constant at all loads from 50 per cent. to 125 per cent., the maximum point occurring between 75 per cent. and 100 per cent. This ensures the most economical operation of the motor, as the loads applied to the motor usually lie within these limits. Several types of starting devices are supplied for use with these induction motors in order to keep the starting current within reasonable limits on sizes larger than 5 horse-power. These include both hand and automatic starters of various types.

The American Carbon & Battery Company, Signal Hill, East St. Louis, Ill., have favored the "Electrical News" with a copy of their 1909 calendar, which is quite unique. It tells of the merits of their carbon brushes in a forcible manner, as the illustration is that of a bulldog (embossed) gazing at one of their brushes, beneath which is the title, "A doggon good brush." This calendar will be a welcome gift to those who receive it.

Verity's Limited, London, W.C., have issued their new catalogue and have departed from the usual practice of issuing it in one large volume. The new issue is in the form of three handy books, capable of going into the pocket. They are as complete as before, and have been brought thoroughly up to date. The three volumes are as follows: Vol. I., Plant, containing all electrical engineering apparatus; Vol. II., Supplies, covering wires, cables, accessories and general sundries;

Vol. III., Electric light fittings, radiators, cooking material. The catalogue contains over 3,000 illustrations and is fully priced throughout. A valuable feature is the new Astor cable code, which is included and which enables one to telegraph for anything in the catalogue at a minimum expense.

### Cheap Rubber a Serious Menace

The Canadian Fire Underwriters' Association have recently made a number of enquiries into electrical construction matters and have been well pleased with the improvements which have been made from time to time in construction work. They are anything but satisfied, however, with the class of rubber-covered wire which is being used. A very poor quality of rubber is used in many cases. This is largely the result of the market being flooded with cheap American goods. The underwriters are considering the question seriously, with a view to finding a remedy.

Referring to the opening of the first pair of tubes under the Hudson River at New York, a correspondent of the Times says: "It has remained for an Englishman, Mr. Charles M. Jacobs, the chief engineer of the Hudson and Manhattan Railway, to succeed in inaugurating the successful completion of an undertaking begun thirty-four years ago and twice abandoned because of lack of capital and engineering difficulties."

There are 6,300 electric lamps installed on the Lusitania, giving the enormous total of over 100,000 candle-power. For heating the first-class quarters 60 electric radiators have been fitted, to say nothing of some 43 heaters in bath rooms for use during the cold weather

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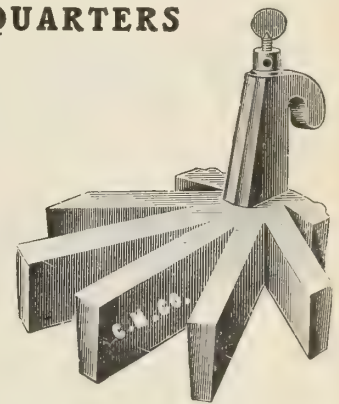
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CANADA

## City of Lethbridge, Alberta, Canada

Tenders for

Municipal  
Power Plant

Specifications, drawings and form of tender may be obtained from the Secretary-Treasurer, City of Lethbridge, Alberta, on and after the FIFTEENTH DAY OF JANUARY, 1909. The following are the sections issued:

- |                             |                                       |
|-----------------------------|---------------------------------------|
| A. Boilers and Accessories. | H. Re-erection of Steam Engine.       |
| B. Economizer.              | I. Condensing Sets.                   |
| C. Feed Pumps.              | J. Crane.                             |
| D. Mechanical Draft.        | K. Switchboards, &c.                  |
| E. Pipe Work and Valves.    | L. Motor Generators and Transformers. |
| F. Steam Turbine Generator. | M. Buildings, Steel Work, Etc.        |
| G. Steam Engine Generator.  |                                       |

Tenders on any or all of the above sections or any combination of the above sections will be received.

Tenders to be enclosed in a sealed envelope addressed "Tenders for Electric Plant" and to be delivered to the undersigned at the City Hall, Lethbridge, on or before the 1st day of March 1909, and to remain open for acceptance for two (2) calendar months from that date.

Each tender must be accompanied by a certified cheque payable to the Secretary-Treasurer, of the City of Lethbridge, for 10% (ten per cent.) of the amount of the tender, which will be returned to the tenderer, unless he fail to enter into contract for the work at the rate stated in the tender.

Plans and specifications may also be seen at the offices of Messrs. Smith, Kerry & Chace, Confederation Life Building, Toronto, Ontario, and the Carnegie Public Library Building, Winnipeg, Manitoba. The lowest or any tender not necessarily accepted.

A deposit of \$10. (ten dollars) will be required for use of plans and specifications, which will be returned upon letting of contracts.

GEO. W. ROBINSON.

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THE WEEKLY FINANCIAL, COMMERCIAL &  
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AJAX LINE MATERIAL CO.,  
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## Tenders

for Supply of

Turbine Pumping  
Machinery

Sealed tenders addressed to the Chairman, Board of Control, Winnipeg for the supply and erection of turbine pump, with electric motor for the City Water Works will be received at the office of the undersigned up to 11 a.m. on MONDAY, FEBRUARY 22ND, 1909. Specifications and forms of tender together with conditions governing tender as prescribed by the City By-laws may be obtained at the office of H. N. Rutan, City Engineer, Winnipeg. The City reserves the right to reject any or all tenders or to accept any bid which appears advantageous to the City of Winnipeg.

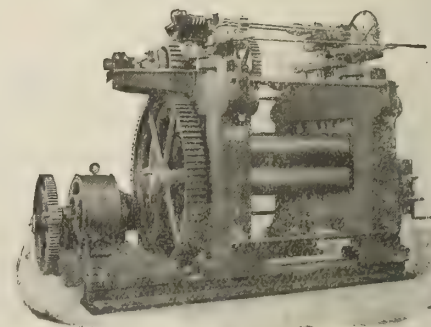
M. PETERSON,  
Secretary.

Board of Control Office,  
Winnipeg, November 25th, 1908.

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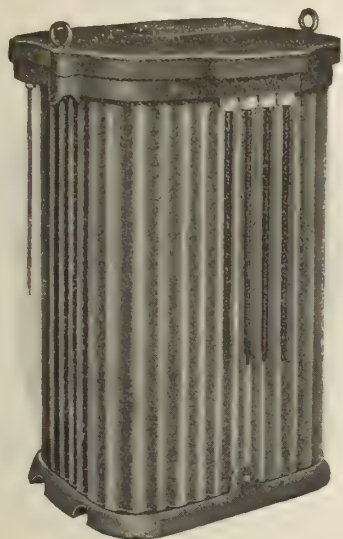
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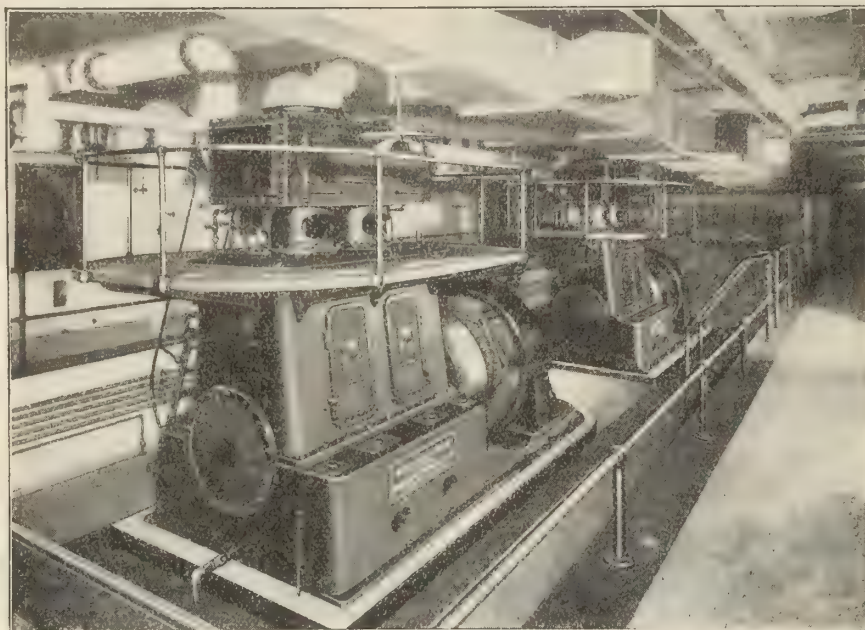
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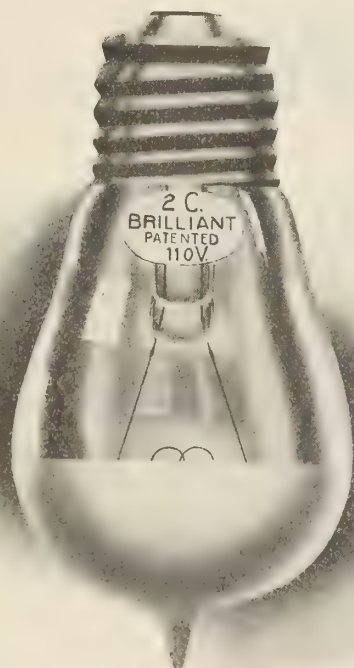
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are of the "soft iron" or Electro-magnetic type, but they possess so many novel and valuable characteristics as to practically constitute a new type of instrument.

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Paris, France—E. H. Cadot, 12 Rue St. Georges  
Berlin—European Weston Electrical Inst. Co., Ritterstrasse, No. 88

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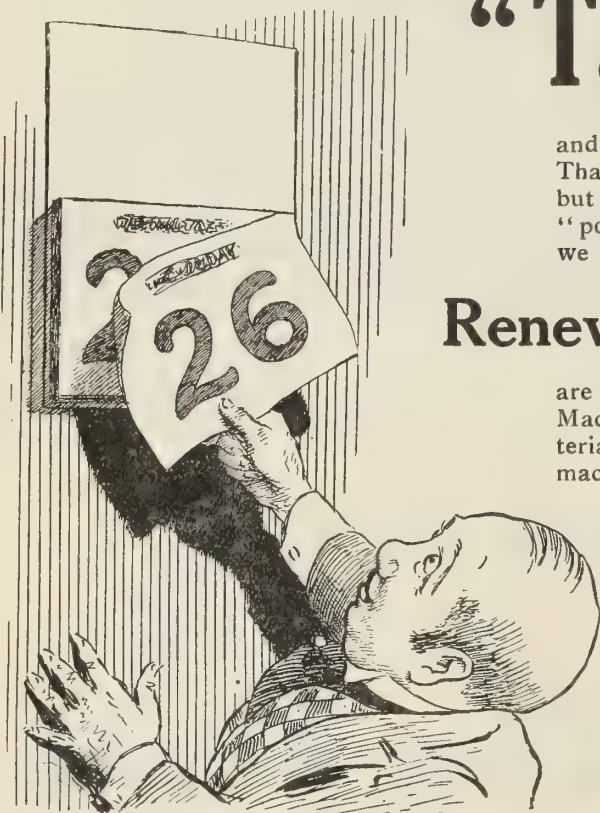
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and gather up your burned out incandescent lamps. That may look like a loss of time on the face of it, but whether you have a large or small business it is “positive waste” to throw away your burn-outs when we can refill them, and

## Renewed Incandescent Lamps

are good as new in quality, better than new in price. Made as carefully as any new lamp, of the same material, by the same class of workers, with the same machinery. The bulbs and bases were used before—that’s the ONLY difference, except the price. You save one-third by buying our Refilled Lamps.

We can either refill your lamps or sell you refilled lamps. Order a trial lot and see how closely we can meet your specifications.

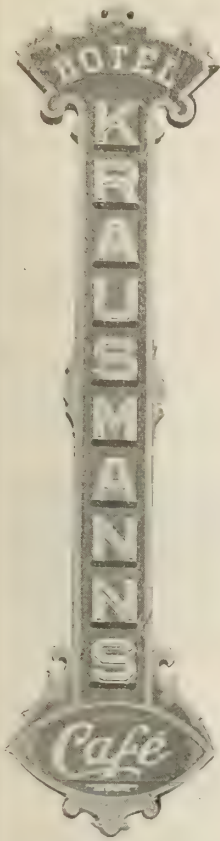
The  
**Dominion Electric Co.**  
St. Catharines, Ontario

# WIRES AND CABLES

of Every Description, For Telephone, Telegraph and Electric Power Purposes

**The Wire and Cable Co.      -      Montreal**





## Mr. Contractor Attention!

We have the experience and  
the equipment to furnish

## Electric Signs

of any style.

### Our Specialties

The patent 3 inch, 12 inch, and  
roof sign letters are unexcelled  
in

**APPEARANCE  
and ECONOMY**

Communicate with us.

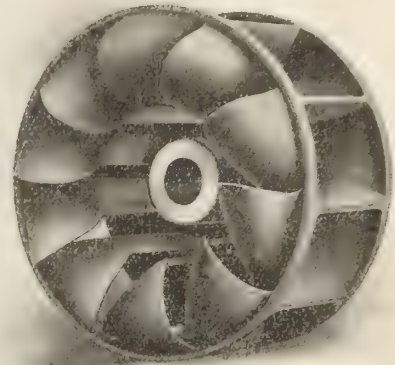
The  
**Flexlume Sign Co.**  
Limited

MANUFACTURERS AND PATENTEES

St. Catharines, Ontario

Installed on King Street,  
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## The "Canadian" Turbine Water Wheel



Only Canadian Designed Wheel on the market and absolutely unequalled  
by any other make.

A saving of 20 to 40% in quantity of water guaranteed and a better quality  
of power.

Write for description, prices and references.

**Chas. Barber and Sons**  
Established 1867  
Meaford, Ontario

## Money in X Cells



Every Dealer should  
handle them. Prompt  
shipments from **fresh**  
stock by the follow-  
ing firms:

Canadian General Elec-  
tric Co., Limited, Tor-  
onto; Central Electric  
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Limited, Toronto; J. A.  
Dawson & Co., Mont-  
real; John Forman,  
Montreal; C. H. L.  
Keeler Co., Toronto;  
Montreal Electric Co.,  
Montreal; Northern  
Electric & Mfg. Co.,  
Montreal; R. E. T.  
Pringle Co., Montreal;  
or by the factory.

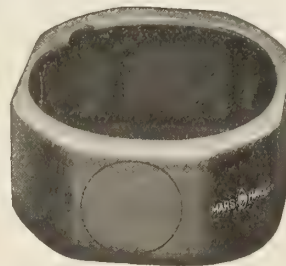
## Electrical Specialties

Limited

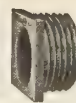
**TORONTO**

Every X Cell is Guaranteed

## Marshall Pipe Ends



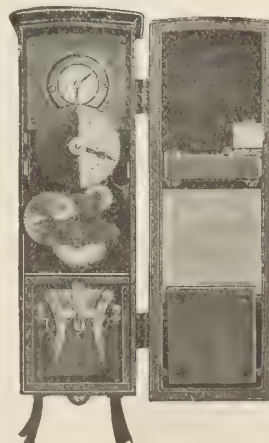
Two drawn steel boxes  
and a few other little  
things make over 200  
combinations. Why  
have a large stock of  
clumsy castings when  
"Pipe Ends" save stock,  
labor and money?



WRITE AGENT

**A. H. W. Joyner**  
6 Wellington St. E.  
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## A. & J. M. Anderson's Electric Time Switch



For flat rate service in-  
sures a square deal for  
the Consumer and Light-  
ing Company.

Used exclusively by the  
largest lighting companies  
because it is reliable.

SOLE AGENT:

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Tel. Main 5240. Cable Address, Trolley, Toronto

**Electrical Contracts Awarded**

Glencoe, Ont.

The municipal council is reported to have awarded to the Colonial Engineering Company of Montreal, Que., the contract for the erection of a gas producer plant of 96 horse-power.

Winnipeg, Man.

Following are particulars of the recommendation of the board of consulting engineers to the City Council in connection with the power plant: For doing the general works the engineers recommend the tender of John Gunn & Sons, Winnipeg, the contract price to be \$779,100. The tender accepted is the second lowest. The lowest was that of William Newman & Company. The engineers recommend that the tender of the power construction department of the city be accepted for the transmission system erection. The price bid is \$89,680, or over \$30,000 lower than the next lowest tender. The board recommend that the tender of the Northern Aluminum Company, for the supplying of an aluminum cable at \$148,050, be accepted. A copper cable would, they report, cost \$219,710. For the supplying of the necessary steel towers, the engineers favor the tender of the Manitoba Iron Works, Winnipeg, at \$3.90 per one hundred pounds, the tender being the lowest. The following are the figures in detail: For general works. — William Newman, \$771,850; Haney, Quinlan & Robertson, \$785,150; Power Construction Department, \$816,806; Thomas Kelly & Sons, \$883,679; Hydraulic Contracting Company, \$905,444. For transmission system erection:—Power Construction Department, \$89,680; Thomas Kelly & Sons, \$111,435; R. McManus & Company, \$182,892. For transmission cable: Northern Aluminum Company, aluminum cable, \$148,050; Thomas Kelly & Sons, aluminum cable, \$157,500; Eugene Phillips, copper cable, \$219,710; Dominion Wire Manufacturing Company, copper cable, \$222,250. For steel towers: — Manitoba Iron Works at 3.90 per pound, being the lowest tender. The City Council subsequently awarded tenders in accordance with the above recommendations.

**International Falls Development**

The Minnesota & Ontario Power Company, which was recently organized with offices in Minneapolis, Minn., has engaged J. G. White & Company, 43 Exchange Place, New York, as consulting and contracting engineers to complete the construction of a large dam and hydro-electric power plant at International Falls, Minn. This plant will be used to develop water power which will be utilized for running a ground wood sulphite and news print paper plant. J. G. White & Company are now establishing a construction plant at a cost of about \$50,000, and this will be used for the construction of an immense dam and power plant which will aggregate from 20,000 to 25,000 horse power. The company has established an operating office at Minneapolis where the buying details will be arranged. The Minnesota & Ontario Power Company will purchase its own lumbering equipment and the machinery for its manufacturing plant. It is understood that the company has further manufacturing projects and will in the future be large buyers of general machinery equipment. It was recently organized with a capital stock of \$7,000,000, and the president, Edward W. Backus of the Backus-Brooks Company, Minneapolis, and a number of other capitalists prominent in the lumber and paper mill business are interested in the scheme.

**Electric Repair &  
Contracting Co.**

119 Lagauchetiere Street West  
**Montreal**

**Electric Apparatus  
of all kinds Repaired**

Special Attention to Electric  
Elevators, Electric Power and  
Generator Installations.

**Electric Wiring**

New and Second-Hand Motors and  
Generators Bought and For Sale

**Geo. E. Matthews, Manager**

**CANADIAN OFFICE & SCHOOL FURNITURE CO. LIMITED**  
PRESTON ONT.  
FINE BANK OFFICE, COURT HOUSE & DRUG STORE FITTINGS.  
OFFICE, SCHOOL, CHURCH & LODGE FURNITURE.  
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Miners and Exporters of

**CANADIAN AMBER MICA**

**KINGSTON, ONT. CANADA**

Write us for your requirements in MICA

P. E. Marchand, E. E. R. W. Farley, C. E.  
W. L. Donnelly, Sec.-Treas.

**P. E. MARCHAND & CO.**

Consulting and Constructing Engineers.

Examinations, Surveys, Reports, Plans, Specifications and supervision of Electric Lighting, Railway and Power Plants, Long Distance Power Transmission. Hydro-Electric Developments a Specialty.  
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**GUY M. GEST**  
**ENGINEER AND CONTRACTOR**  
**EXPERT ELECTRIC SUBWAY BUILDER**

277 Broadway,  
**NEW YORK**

Union Trust Bldg.  
**CINCINNATI, O.**

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COUNTRIES  
LONG EXPERIENCE  
IN PATENT LITIGATION  
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**Will Outlast All Other Kinds**

Get our Prices. We can fill all sized orders from our own stock. **150,000 ON HAND**  
Twenty-eight years have we been producers.

**W. C. Sterling & Son Co.**

Principal Office: **MONROE, MICHIGAN**

Yards: Bay City, Omer, Boyne Falls, Cass City and Monroe

## Cedar Poles

from

**"British Columbia"**

The strongest, straightest and soundest pole that grows in the "WORLD."

We can ship them East as far as Quebec and compete with Eastern poles-40 ft. and longer.

**In Ontario** we can compete only on 35 ft. poles and longer.

**In Manitoba**—30 ft. and longer.

**In Alberta and Saskatchewan** we are "IT" on all lengths.

Don't be afraid of them. They are the leading pole for City and Power line construction.

Yards on C. P. Railroad in British Columbia, Kootenay District.

We name delivered prices **always** and guarantee immediate shipment.

Write for car load prices on our **Oregon Fir Cross-Arms.**

The

**Lindsley Brothers Company**

Spokane, Washington

## Carbolineum

Ideal Wood Preservative

**PREVENTS ROT AND DECAY IN WOOD**

Invaluable for Telephone Poles, Shingles, Fence Posts, Railway Ties, Paving Blocks and all Wooden Structural Work. Cheap as Paint and as Easily Applied.

**Carbolite Carbolineum Co., Limited**

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## Telephones

We manufacture **TELEPHONES** for all kinds of service—Central, Exchange, Factory, Warehouse, etc. Our

### Desk Telephone

as illustrated is a handsome instrument. Perfect in construction and design, with no exposed contacts or wires, and has many other points of advantage.

Fully guaranteed and sold on merit.

Send for our new Telephone Catalogue.

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Limited

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## W. T. HENLEY'S Telegraph Works Co., Ltd.

**LONDON, ENGLAND**

Sole Representatives for Canada

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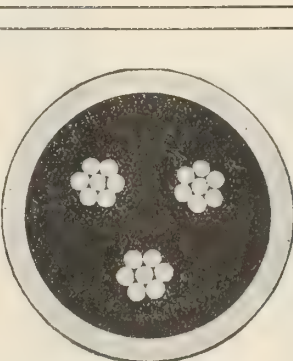
Coristine Buildings

Room 121

**MONTREAL**

**Henleys**

**Cables**



7'085 H. T. 3 core 7000 volt paper lead covered cable.

## Insulated Wires and Cables

**JOINTING MATERIALS**

## THE TELEPHONE



Is a Companion, Friend and Servant Combined.

Invaluable for convenience in the household.

### Long Distance Telephone Service

has no equal for the facility it affords in business life.

Full particulars as to rates and service at the nearest office of the

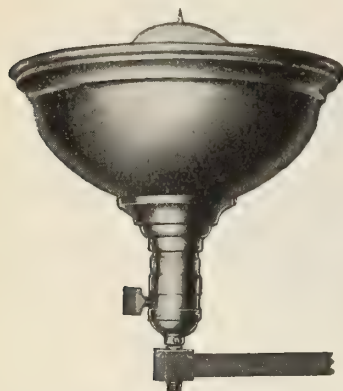
**Bell Telephone Company of Canada**

# "I-COMFORT" SYSTEM

a practical, efficient method of  
**Indirect  
Illumination**

This system affords a nearer approach to daylight than any other method of artificial illumination, with a current consumption no greater than for the systems of direct lighting now in general use.

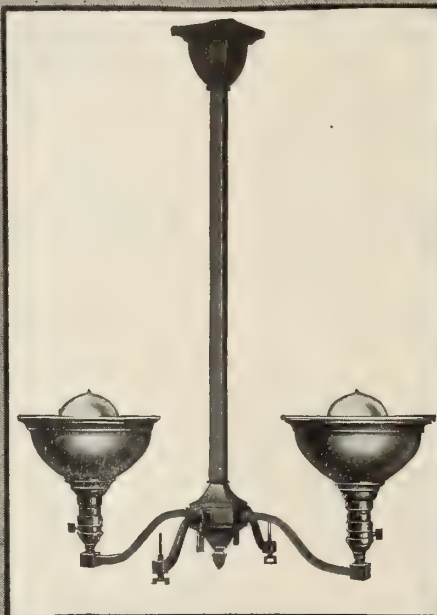
This is the long-looked-for comfortable lighting system. Our developments have made it commercially available—i. e., within the reach of persons of moderate means.



The lights are entirely concealed by inverted reflectors of special design, set in neat brass receptacles.

There is no blinding glare—no lamps in sight—just an even reflected light, wonderfully free from shadows and evenly distributed.

One 60-watt Tungsten lamp gives ample illumination in the room illustrated



Room illuminated with single fixture containing one 60-watt Tungsten lamp

In use for months in residences, offices, halls, assembly rooms, etc., the "I-Comfort" System is already well past the experimental stage, and has conclusively proven itself to be the most efficient means of eliminating the one obstacle to the free use of Tungsten lamps—the blinding glare of the naked filament.

Central Station men enthusiastically endorse this method.



Jobbers and fixture manufacturers! be the first to present this in your territory.

One for your own personal use will make you an enthusiastic booster of the "I-Comfort" System of illumination.

Write to-day for further information and details.

PATENTS APPLIED FOR.

**The National X-Ray Reflector Co.**  
TRADE-MARK  
247 E. Jackson Blvd., Chicago, Ill.



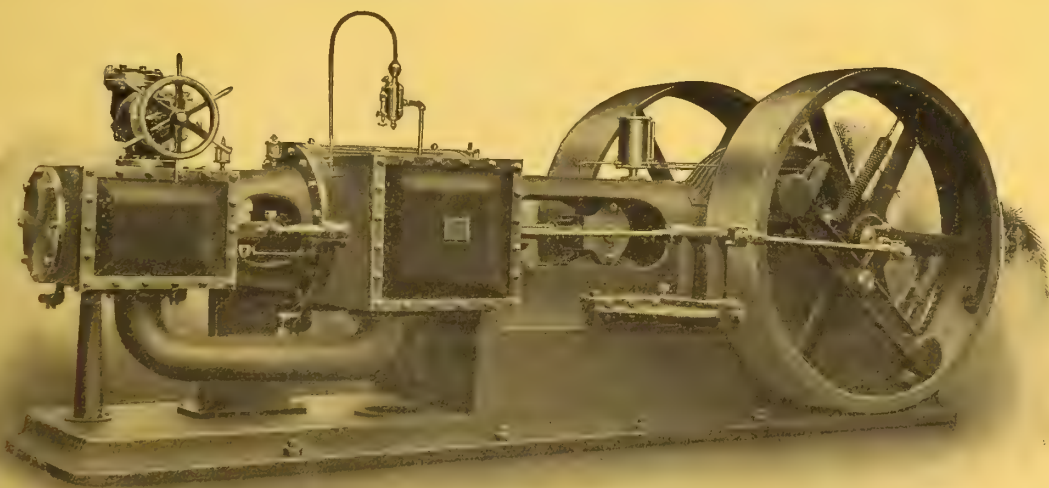
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**The Electrical Maintenance & Repairs Co.**

162 Adelaide Street West, Toronto

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## **THE McEWEN HIGH SPEED AUTOMATIC** In Simple and Compound Units



Unexcelled  
for  
Simplicity  
Efficiency  
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Economy

*17-28 x 20 Tandem Compound.*

Write For Latest Bulletin and Prices.

**Waterous Engine Works Co.**  
BRANTFORD, CANADA



## Kolloid-Wolfram Lamp

Life 1,000 hours. Consumption 1.1 Watt Guaranteed.

THE ONLY COMMERCIAL METALLIC FILAMENT  
LAMP ON THE MARKET

### Midland Electric Co.

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**ALL OTHER MAKES**

ARE YOU SELLING THEM?

**MUNDERLOH & CO., MONTREAL**



## Municipalities and Illuminating Companies

Can save money on Electric  
Plant and on its Operation  
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municating with

**Canadian Electrical & Motor Co.**

Successors to United Electric Co., Limited

468-474 King St., West

TORONTO

## The Electrical Construction Co. of London, Limited

32-40 Dundas Street, London, Can.—Phone 1103.

Perfection Type

## DYNAMOS AND MOTORS

Multipolar, Bipolar, Direct Connected or Belted.

High efficiency. Designed for any required  
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Estimates Cheerfully Given

Descriptive matter furnished  
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We can keep you running while we make your repairs

WRITE US

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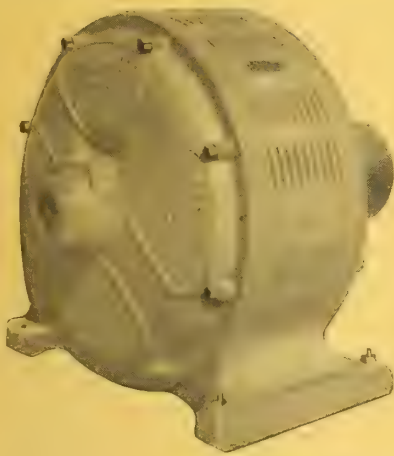
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MONTREAL



# Canadian Electrical News

## & Engineering Journal



### **"SUPERIOR"**

Alternating  
Current

### **Induction Motors**

Single Phase  
Constant Speed

Multi Phase  
Variable Speed

### **Alternators for Power and Light**

"SUPERIOR" Direct Current  
Machines to Suit all Conditions.

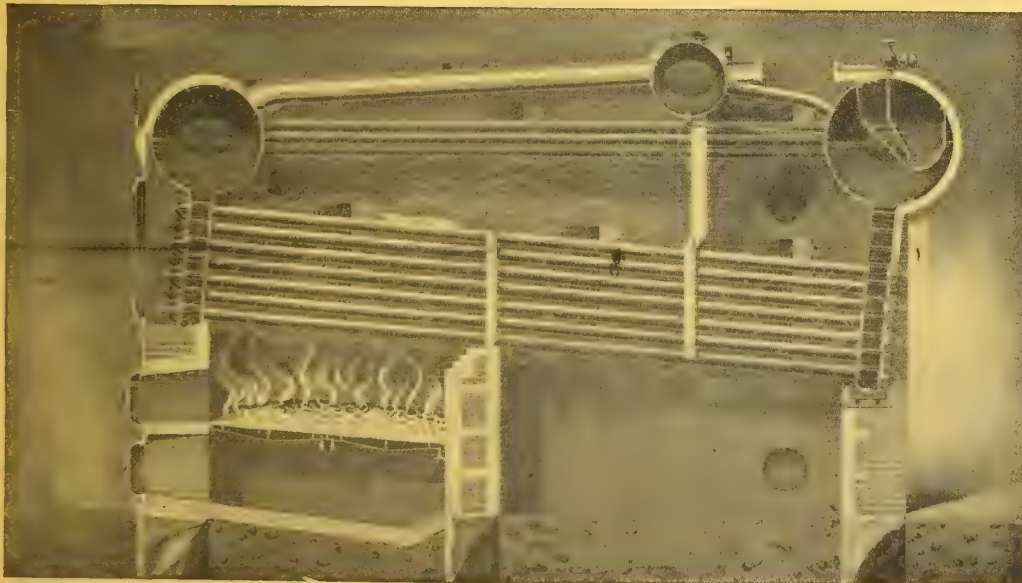
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Successors to United Electric Co., Ltd.

Limited

468-474 King Street West, Toronto

## **Canada Water Tube Boilers**



**Superheat  
Steam**

**Purify  
Feed  
Water**

Send for  
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## Eugene F. Phillips Electrical Works

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### Railway, Feeder and Trolley Wire

Electric Light Line Wire, Incandescent and Flexible Cords  
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Cables for Aerial and Underground Use

U.S. Factory: AMERICAN ELECTRICAL WORKS, Providence, R.I.

New York Office: 26 Cortlandt Street.

Chicago Office: 135 Adams Street.

## "SHAWMUT"

### N. E. Code Standard Porcelain Bases

And Indicating Enclosed Fuses

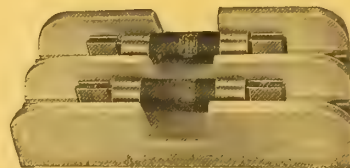


MAINLINE AND  
BRANCH PORCELAINS  
OF ALL KINDS



#### NOTICE

The Lugs do not  
Project Beyond  
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We have dropped  
the use of castings  
in our Bases

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## CHASE-SHAWMUT CO.

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Manufacturers of

The Most Symmetrical and Substantial Line of  
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Everything Fully Guaranteed

Also Dealers in Everything Electrical.  
Largest and Most Complete  
Line in the East.

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# Benjamin Socket Extension

Offers a convenient means for attaching Glassware where the outlets do not otherwise permit it.

Cat. No. 91.

List Price \$0.25.

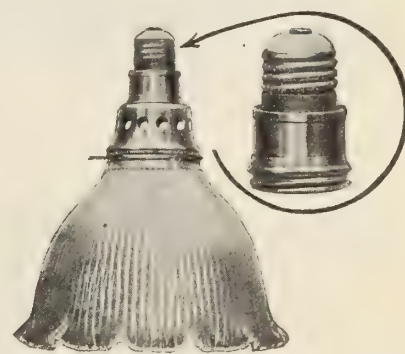
Std. Pkg. 50.

Shell is provided with bead for standard shade holder.

Is especially serviceable for use in connection with flush sockets and ceiling receptacles.

Increases the length of the socket only  $1\frac{1}{4}$  inches.

A Simple and Inexpensive Device  
WRITE FOR DISCOUNTS



**Benjamin Electric Mfg. Co.**

64 York Street., TORONTO

## "DIAMOND H"

### SWITCHES

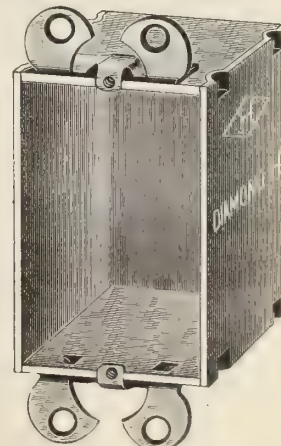
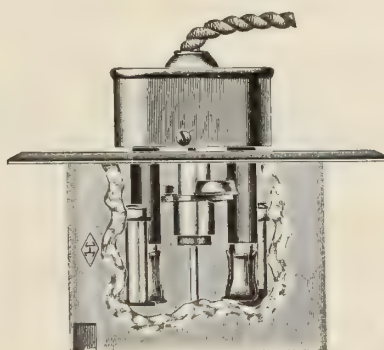
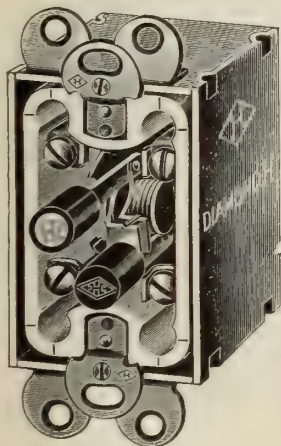
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



### APPLIANCES

Galvanized Steel all Cases  
Automatic Flush Receptacles and Plugs



MANUFACTURED BY THE HART MANUFACTURING CO., HARTFORD, CONN.

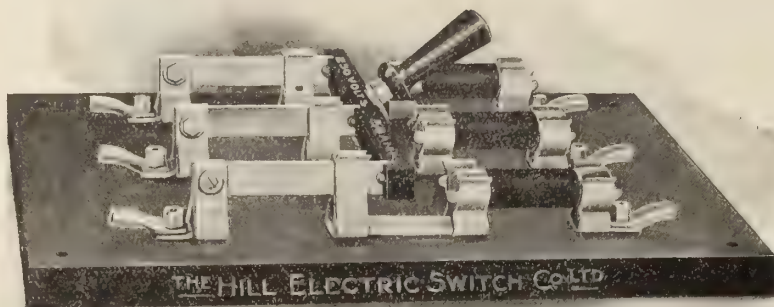
Canadian Agents:

**C. W. Bongard Co., Ltd.,**

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# Type "D" Switch Punch Clips

An ALL COPPER Switch



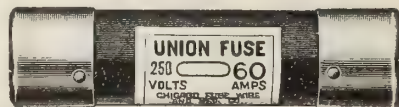
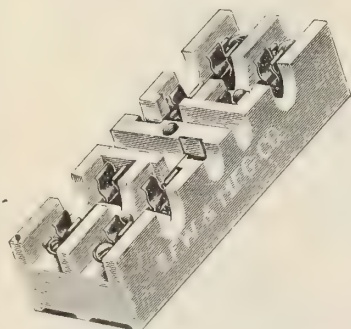
HIGH - GRADE  
and INEXPENSIVE

All styles up to 100 amperes  
capacity.

## The Hill Electric Switch & Mfg. Co.

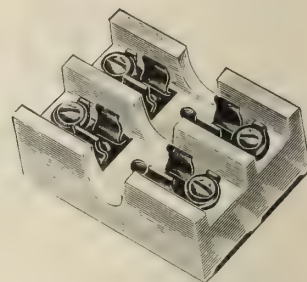
Limited

1560 St. Lawrence St., Montreal



# UNION

N. E. Code Fuses and Blocks



"Union" Enclosed Fuses

Manufactured by Chicago Fuse, Wire and Manufacturing Co., Chicago and New York

"Union" N. E. Code Blocks

No matter what your wants are in **Enclosed Fuses**, we can always  
meet the demand in **Amperes, Voltage and Current Capacity.**

## FUSE MANUFACTURERS FOR TWENTY YEARS

**Union Fuses and Cut Outs** are used by all the largest Power and  
Railway Companies in the United States.

EVERY FUSE GURANTEED

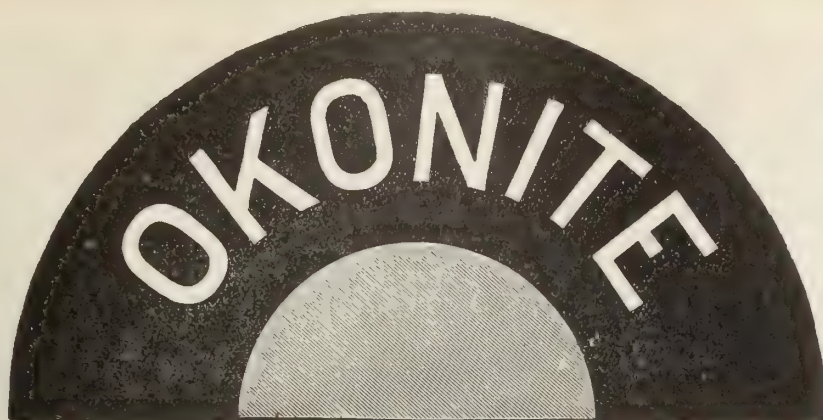
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For Sale by **Central Electric & School Supply Co.**

36 Adelaide Street West

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THE STANDARD  
FOR  
RUBBER  
INSULATION

Okonite  
Insulated

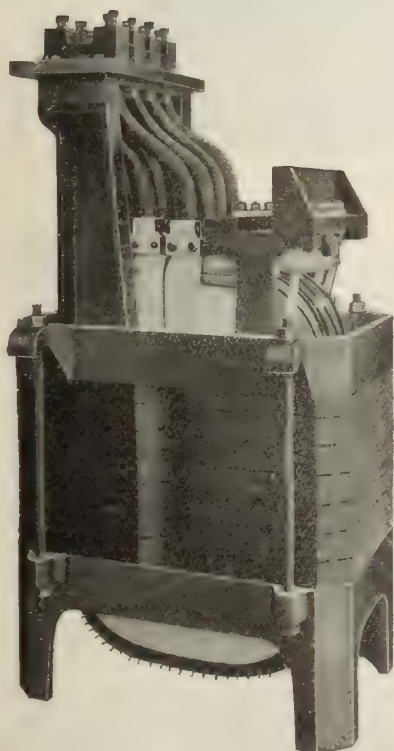
# Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Chandee } Managers.  
H. Durant Cheever }  
Geo. G. Manson, General Superintendent.  
W. H. Hodgins, Secretary.  
W. C. Chandee, Assistant-Secretary.

The OKONITE COMPANY, LIMITED  
253 Broadway, NEW YORK, U.S.A.



# Transformers

Special Transformers for  
Electric Reduction and  
all Power purposes.

Polyphase Induction Motors  
Integrating Watt Meters  
Incandescent Lamps  
Jandus Arc Lamps



Lighting Transformers

The  
**Packard Electric Co.**  
Limited

Branch Offices:  
Montreal - Winnipeg

Head Office and Works: St. Catharines, Ont.

# BELLISS

## ELECTRIC SERVICE

### Steam Engines

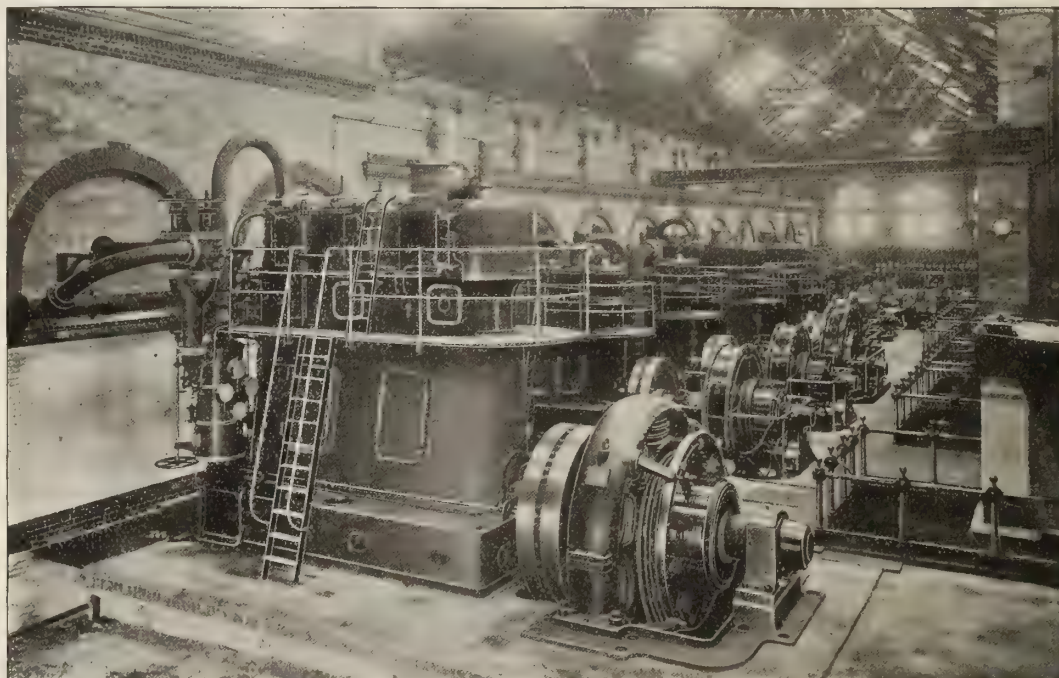
### Exhaust and Live Steam Turbines

Forced  
Lubrication

Hot  
Bearings  
Unknown

Guaranteed  
Steam  
Economy

Even  
Turning



Noiseless  
Running

Minimum  
Space

Surprisingly  
Low Oil  
Consumption

Simplest  
Compounds  
and  
Triples  
on the  
Market

Croydon Electric Station—8850 H. P. Belliss Engines.

One Engine from the above Station was returned to Builders' Works for alteration after **5½ years regular service**. It was re-tested in the exact condition in which it was returned. Below is a comparison of this test with that made when engine was new. Both tests were independently verified.

	Test when new			Test after 5½ years service		
	Full	$\frac{1}{4}$	$\frac{1}{2}$	Full	$\frac{1}{4}$	$\frac{1}{2}$
Efficiency .....	89	87.7	84.8	93.5	93	92.2
Water per B.H.P. ...	19.4	19.9	21.3	19.2	19.1	20.4
B.H.P. ....	218.4	162	107.7	218	162	108

Amount of wear on main bearings .0025" Crankpins H.P. .005" L.P. .009"

**Belliss & Morcom Limited, Engineers**  
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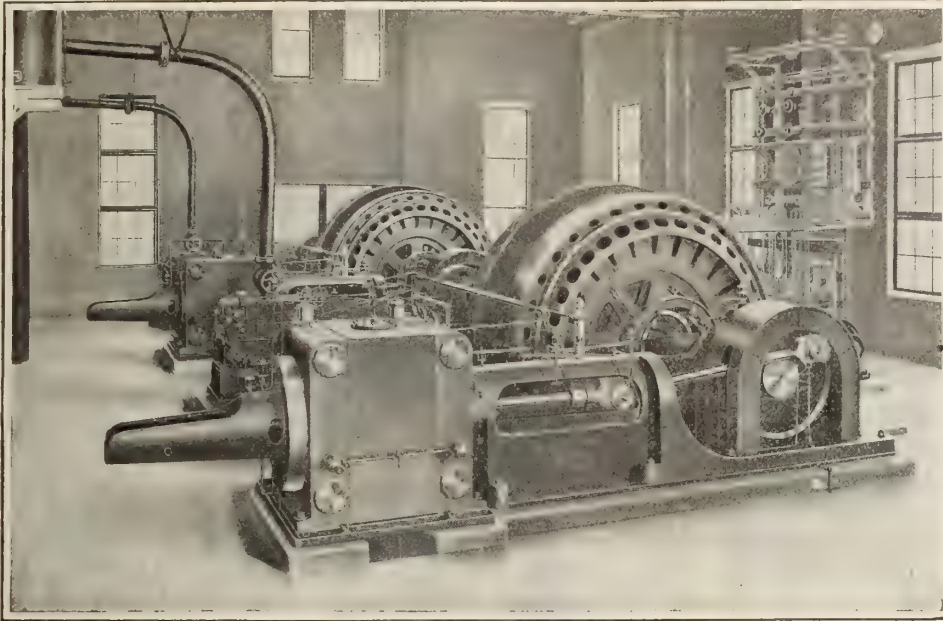
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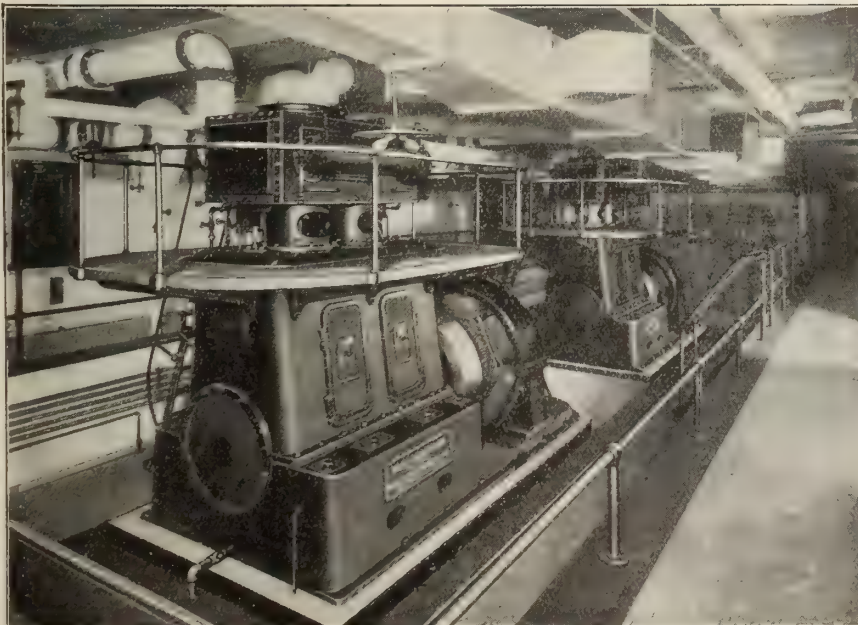
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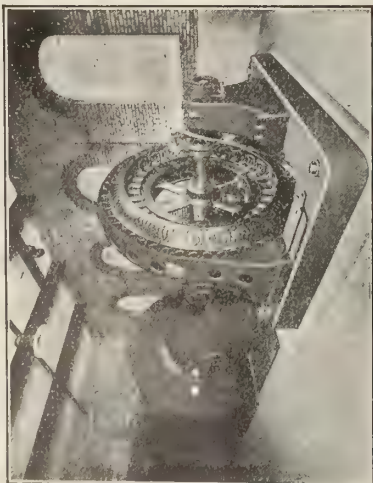
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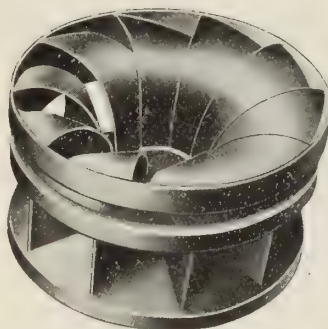


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**425 K. W. WATER WHEEL TYPE  
ALTERNATOR**

Bulletin 1050.



**WATER WHEELS**

for heads up to 600 ft. and capacities to 20,000 h.p.  
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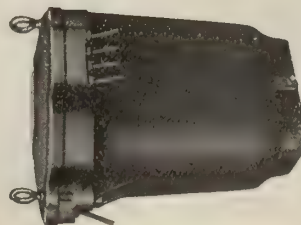


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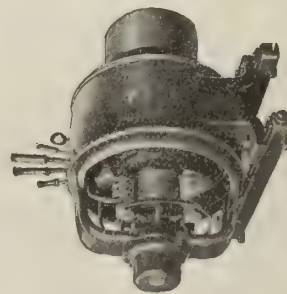


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**TRANSFORMERS**

Lighting Bulletin 300,  
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**DIRECT CURRENT  
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Bulletin 1057.



**INDUCTION MOTORS**

Bulletin 301.



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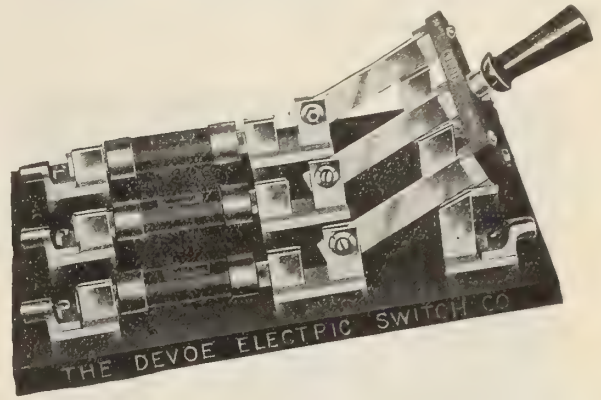


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Type "B" Switch, 250 Volts. Front connected for National Electrical Code Fuses.

We also want to quote you on that next order for switches, and switchboards. Our goods give complete satisfaction.

**The Devoe Electric Switch Co.**  
157 Craig Street West, MONTREAL

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Give your patrons the best  
Arc Lamp for all services

## The Gilbert Arc Lamp

Why use two globes and lose  
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**One Globe for enclosed  
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### New Electrical Contractors Association

An Electrical Association for the Province of Quebec, which promises to become an important factor in the business and social life of all who are specially interested in the electrical business, was recently formed at a meeting in Montreal. The association will include supply houses, manufacturers, contractors, and all who are in the electrical business. The main idea is to develop a more harmonious feeling between electrical interests. One important step which will be taken, will be to make an application on behalf of the electrical contractors'



E. W. Sayer, Montreal. President of the new Quebec Electrical Association.

end of the association for an enactment by the Provincial Legislature for the registration of all electrical contractors. Efforts will also be made to improve the standard of electric wiring.

The association will hold general meetings on the second Wednesday of each month at the club room, St. Catherine street. At these meetings the time from 8 to 9.30 o'clock will be occupied with special business and the delivery of a lecture by some member. The balance of the evening will be devoted to social matters. A special committee has been appointed to look after this feature. The formation of this association should prove of much benefit to the electrical business and profession in Quebec. The example, in fact, is one which might be copied with advantage by other Canadian cities.

At the inaugural meeting the following officers were appointed for the present year: President, E. W. Sayer, Sayer Electric Co.; Vice-President, J. A. Valois, Chambly Electric Co.; 1st Vice-President, M. Rubenstein, Scott & Rubenstein; Treasurer, W. B. Shaw, Montreal Electric Co.; Secretary, W. A. Stanley; Executive Committee, Messrs. C. J. Young, Henry Morgan & Co.; J. G. Brock, Collyer & Brock; J. A. Lachapelle, Eastern Electric Co.; J. A. St. Armour; N. Simoneau, Simoneau Electric Co.; C. G. Matthews, Electric Repair & Contracting Co.; Lacasse Rousseau, Canada Electric Co.

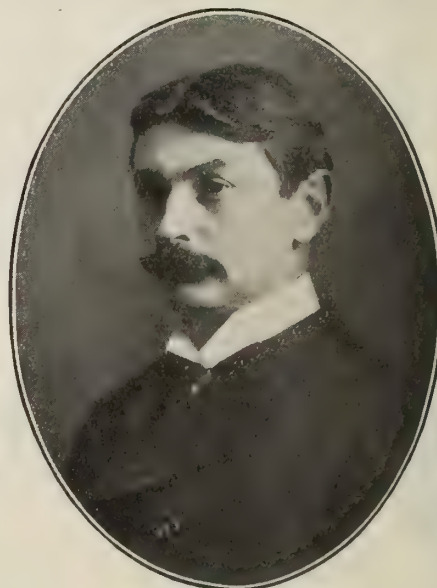
Those who attended the meeting were as follows:

Messrs. J. A. Valois, Chambly Electric; W. B. Shaw, Montreal Electric; E. W. Sayer, King Electric; Mr. Mount, Sayer Electric; J. D. Lachapelle, Eastern Electric; L. E. Simoneau, L. Rousseau, Canada Electric; P. DeSerres, International Electric; C. G. Matthews, Electric Repair & Contracting Co.; J. A. St. Armour, S. Deutoch, Electric Maintenance Co.; A. MacConnell and C. J. Young, Henry Morgan & Co.; A. S. Balne, S. Pins, W. C. Nicholson, J. A. Hicks, Hicks Electric Co.; Maurice Pelletier, H. H. Willetts, F. J. Parsons, McDonald & Willson; J. E. Scott, M. Rubenstein, Scott & Rubenstein; N. Simoneau, Simoneau Electric Co.; Jas. Bennett, Canadian Fire Underwriters' Association; Alcide Chausse, building inspector; H. Morris, W. J. O'Leary.

From a statement furnished to the Power Committee of the Winnipeg City Council it appears that Winnipeg consumers of current for electric lighting are getting a lower rate than any of the cities of Canada, with the exception of two, and so far as can be ascertained much lower than any of the consumers in the large cities of the United States. The small consumer using 50 k.w. hours or less per month pays in Winnipeg, according to this statement, a net price not exceeding \$4.50. Ottawa, by having cheap power at its door on the river, is able to do better than this by 90c a month, and Vancouver by 10c a month.

### Harry D. Bayne Resigns

Mr. Harry D. Bayne, eastern manager of the Canadian Westinghouse Company, Limited, has resigned. It is understood that the resignation will go into force in a few weeks, and an announcement will be made



Harry D. Bayne.

later on as to Mr. Bayne's future movements. Mr. Bayne was manager of the Montreal office with jurisdiction over the Halifax and Eastern business.

The Westinghouse Company have favored the "Electrical News" with a copy of the Westinghouse Traction Brake Company's pamphlet upon "Electric Pump Governors." The pamphlet deals in an interesting manner with these governors and illustrates the principles upon which they are designed. It will be found useful by all who are interested.



# SUNBEAM LAMPS

**ARE MADE BY LAMP MAKERS**

**We don't make anything else**

**It's good to know one line of  
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**The Label is the guarantee of  
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**The Sunbeam Incandescent Lamp Co.  
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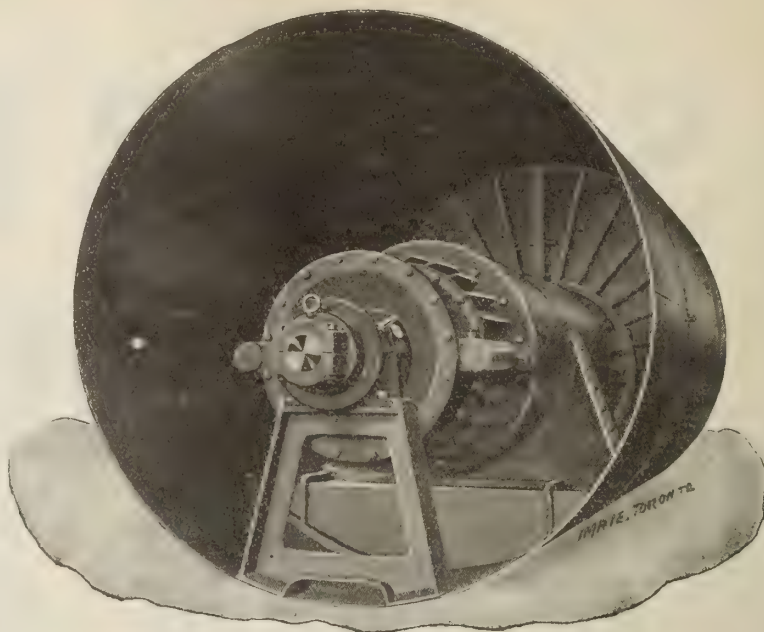
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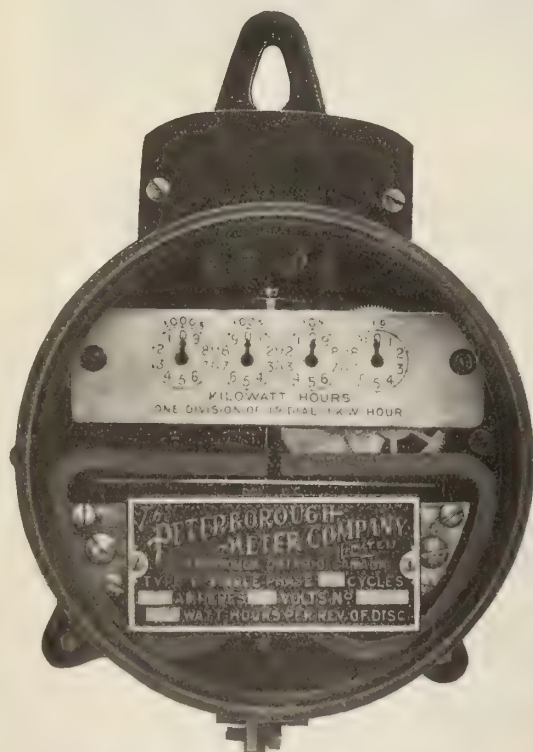
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## Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

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# Canadian Electrical News & Engineering Journal

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### EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## Electric Vacuum Cleaners

Of all the electrical devices which have lately been offered to the householder the vacuum cleaner is without doubt one of the most valuable. That this is so, and that its use is going to be very widespread, will be appreciated when one reflects on the really enormous number of makes already on the market, notwithstanding that it is only about two years since the first designs made their appearance. Three main types are now being offered to the public, namely, the non-portable form, a fairly large and heavy class of machine; a semi-portable design with pipes and hand tools attached, and the entirely portable and self-contained form, much resembling an ordinary carpet sweeper, the only difference being that the brush is motor driven, and that its usual action is reinforced by a suction hood, placed over the brush, the vacuum being obtained by means of a pump, geared to the same motor that drives the brush.

The non-portable form is naturally suitable only for public buildings, such as hotels and theatres, or the

larger residences, because as at present built the cost is far too high for ordinary household use. At the same time it is entirely probable that smaller and much less costly equipments of this type will be developed for this class of work, because such a design will naturally be placed on a permanent foundation in some convenient point, say the cellar, under which circumstances, the requirements of light weight and extreme compactness required by portable apparatus not being present, the initial cost can be considerably lowered. Another reason that will bring this form into favor will be that of reliability, in that the designer who is not cramped for room nor cut down to the last ounce in weight must of necessity produce a more enduring machine than he who has to face these two bugbears at every turn. The suction from this type of machine will probably be distributed to the various parts of the house by a pipe, with an outlet on each floor, and beside it a control switch, for starting and stopping the motor. Rubber hose, terminating in appropriate tools, will enable the operator to reach every corner of every room. As between the other two types, the semi-portable and the electrified carpet sweeper, it is somewhat hard to choose. The former will probably do better work in corners and under that furniture which cannot conveniently be moved, but the latter is much less complicated, and on large clear areas should do excellent work.

Without doubt some form of this device is going to come into very general use if the householder be kept informed on the subject. Consequently, it behooves every central station to see that their customers have every opportunity of investigating the question, as every machine that is placed will not only be a boon to the purchaser, but will also be another little step toward the Mecca of a great big day load. The smallest use a  $\frac{1}{8}$  h.p. motor, while a great many are equipped with  $\frac{1}{4}$  and  $\frac{1}{2}$  h.p. machines, obviously a nice little addition to your output.

## Street Lighting Equipment

Last month we were speaking of the general trend of practice in street lighting, from which we saw that in all probability the enclosed carbon arc will soon have to share the field to an ever increasing extent with the magnetite or some of the other more efficient arc lamps which have lately come into production. Further, that the field of the carbon arc will be encroached upon by another type of competitor as well as by these improved arc lamps, namely, by the series tungsten, the high efficiency of this latter, standardized at  $1\frac{1}{4}$  watts per candle, rendering it an exceedingly suitable illuminant for a great many places where the carbon incandescent was not entirely able to cope with the carbon arc. As between the two new systems it will sometimes be hard to make a decisive choice, though it is obvious that it will be only in the larger cities that there will be a field for separate arc and incandescent circuits. This will mean that in the great majority of cases the equipment will be a compromise, tungstens being installed for the



greater part of the ground to be covered, namely, the lighting of the residence streets, with a few arcs for the business portions. As far as a choice of amperage is concerned, the circuits will naturally be 4 amperes if magnetites are put in; or else, if carbon arcs be installed, 6.6 amperes will be the standard. In fact, even if installing tungstens only, it may frequently be best to make the circuit of this amperage, as then it will be possible to put in arc lamps at any time should such be desired later on. About the only possible exceptions would be those cases where a plant was using 25-cycle current, or where it was not thought of any advantage to provide for the possible future use of arc lamps. In the first of these cases, namely, on 25-cycle plants, a 4 amp. circuit would probably be most advantageous, as carbon arcs could never be used, and that amperage would provide for the introduction of magnetites with a minimum of change in the system. In the second case a current of somewhere about 3 amperes would probably be found the best, as that current allows the manufacture of a slightly better tungsten than if the amperage were greater, besides which the cost tends to be less; further, the power factor of the circuit will generally be better, and the line drop will be smaller.

The devices used to support arc and incandescent lamps have been fairly standard for some little time back, but along with the changes in the lamps themselves have naturally come various improvements in mast arms and lamp brackets. The most notable innovation in the former is an arm, but recently placed on the market, which is entirely self-contained; that is, there are no braces or struts, the arm, which is made of pipe, being strong enough to carry itself and the lamp without any of the accessories usually provided. Besides this the wiring is entirely concealed, being carried from the pole to the lamp inside the arm itself. Trimming facilities are provided by a swivelling plate, placed approximately in the centre of the arm, which allows the outer end of the latter to be swung in towards the pole, thus bringing the lamp within reach. If this design, which is comparatively new, works out satisfactorily, it will mark quite an innovation in arc mast arms.

Just as improved distribution is one of the main features of the latest arm lamp, the magnetite, so it is of the latest forms of street reflectors, of which several new designs have been placed on the market coincident with the introduction of the series tungsten lamp. Perhaps the radial wave type is the most representative of the new forms, as the aim of all of them is wider distribution, and that design throws the light outwards to a very marked degree, covering a much wider area than would be lighted by any of the earlier forms of reflectors. In addition to this feature of wide distribution, quite a number have wire guards provided to protect the lamp, while in nearly all the consumer is offered his choice of a copper hood and reflector, or else steel, covered with a porcelain enamel, obviously very superior construction as compared with the air drying japan so commonly in use up to the present

## The Underwriters and the Grounding Question

Apropos of the letters from "X. Y. Z." and "Live Wire" which appear in this and the two previous issues of the "Electrical News," it is interesting to note the discussion which has been going on in the columns of "Electrocraft" on substantially the same question. The subject there is the whole general question of the life hazard in electrical construction, with perhaps particular reference to the attitude of the Underwriters towards grounding. In general terms it is stated that the Underwriters' refusal to make the Code mandatory on the subject of grounding, instead of leaving it simply permissive, for which position they have often been very severely criticized, is due to the fact that the Underwriters have no real jurisdiction on such a point, they being confined strictly to the question of fire risk only. Most of those who have taken part in the correspondence referred to agree on this point, and further make the suggestion that the proper people to take the matter up are the municipal authorities, as they alone would have the power to enforce such a requirement. This view is doubtless correct, though it seems to us that while the enforcement of any such ruling might well be left to local authority, in Canada the ruling itself might better come from some central body, such as the Railway Commission, or even be incorporated in the Electric Light Inspection Act. Otherwise, if left to a multiplicity of authorities, we would probably have a great variety of rulings and this would be a source of much confusion and expense to those companies which happened to be operating under the jurisdiction of more than one municipality.

It is important to note that the above correspondence is unanimous in recommending the grounding of transformer secondaries, more particularly when such well known names as those of Messrs. Elihu Thomson and Wm. L. Puffer are included among the signatures.

---

Dr. Eugene Haanel, Director of Mines for the Dominion Government, has returned from a visit to Durnarvet, Sweden, where he went to inspect the new electric smelting furnaces recently opened. He reports that the complete success of the electric smelting process of treating iron ores has been demonstrated. The new furnace is very similar to a blast furnace in which the "tuyers," that is, the apparatus for introducing the blast, are replaced by electrodes. A three-phased current is employed and about 700 horse-power delivered to the furnace, which is large enough to employ 1,500 horse-power. Dr. Haanel assured himself that the furnace in every way met his expectations as a solution of the problem of electric smelting on a profitable commercial scale. The furnace worked well. The electrodes required no regulation, and the instruments showed that the current was steady and without fluctuation. The fact that these new furnaces have proved a success in the electric treating of iron ores is of great importance to the iron and steel industry of Ontario and Quebec.

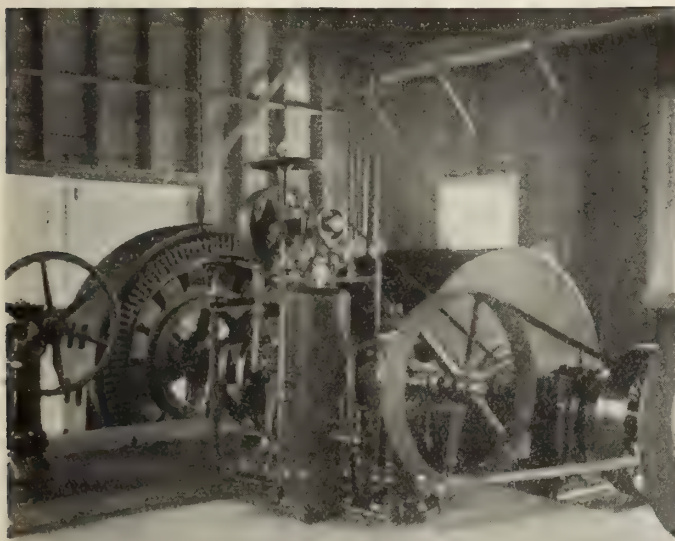


# Hydro-Electric Power in Yukon Mining

Description of Yukon Gold Company's  
Plant, By R. E. W. Hagarty, B. A. Sc.

Mr. R. E. W. Hagarty, B.A.Sc., delivered an interesting address recently before the Engineer's Club of Toronto upon the subject of "Hydro-Electric Mining in the Yukon." Mr. Hagarty has recently spent several years in the Yukon and is in close touch with the development work of that country. In the introduction to his

one of these dredges is 250. They are built by the Bucyrus Company of South Milwaukee. Mr. Hagarty's descriptions of the hydraulic and hydro-electric installations were particularly interesting to the Engineers' installation consists of a high head power development and transmission line. The power house is located near the edge of the Rocky Mountains, about 35 miles north-east of Dawson. It has a head of 710 feet and is developed in units of 625 k.w. On account of the high head, a Pelton wheel, 4 feet in diameter, is used. The water is carried down the hill in 24-inch steel pipe and fed to each Pelton wheel by 16-inch pipe nozzles which range



Pelton Wheel Unit in Power House.

address Mr. Hagarty spoke at some length of the mining work of the Yukon Gold Company at Bonanza, Klondike, Hunker, Eldorado and other creeks in the vicinity of Dawson City. The company obtain gold from the hillsides both by hydraulic operations and by steam.



Electrically Operated Gold Dredge.

from  $4\frac{1}{4}$  inches to  $3\frac{3}{4}$  inches, with a special 2-inch diameter size.

The wheel is shaft connected to a Canadian Westinghouse dynamo which generates at 2,200 volts, three phase, 164 amperes, per terminal, 450 r.p.m. This is stepped up to 33,000 volts and sent out over a transmission three-phase line about 40 miles long to be used on dredges at 440 volts. The governing apparatus used in connection with this installation is made by the Sturgess Engineering Department of the Ludlow Valve Manufacturing Company, Troy, N.Y. It is speed regulated to 450 r.p.m.



Transmission Line Crossing Flume.

From the creek bottoms and valleys they obtain gold by continuous chain bucket dredges, which cost from \$100,000 to \$300,000 each, delivered in the Yukon. They have a capacity of from 40,000 to 70,000 cubic yards per month with 20 hours a day. The total horse power of

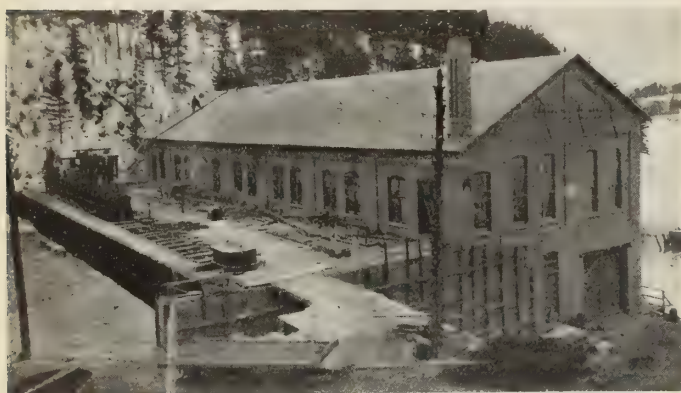
The American Institute of Electrical Engineers will celebrate the completion of its first quarter of a century with an anniversary dinner at the Hotel Astor, New York City, on March 11th. Mr. T. C. Martin has been appointed chairman of the Dinner Committee.



# Hydro-Electric Power Plant at Kenora, Ont.

## Interesting Solution of Problems in Erection of Power House—A 5000 H.P. Plant

The town of Kenora, Ont. (formerly Rat Portage), has a population of about 7,500, and is situated at the northerly end of the Lake of the Woods, at the point where the lake empties into the Winnipeg River. The main line of the Canadian Pacific Railway passes through the town of Kenora. The discharge of the Lake of the Woods, which drains the Rainy River district, about 23,000 square miles in area, enters the Winnipeg River through two natural outlets, about half a mile apart, known as the eastern and western outlets. There is a fall at each end of these outlets of from 17 to 21 feet,



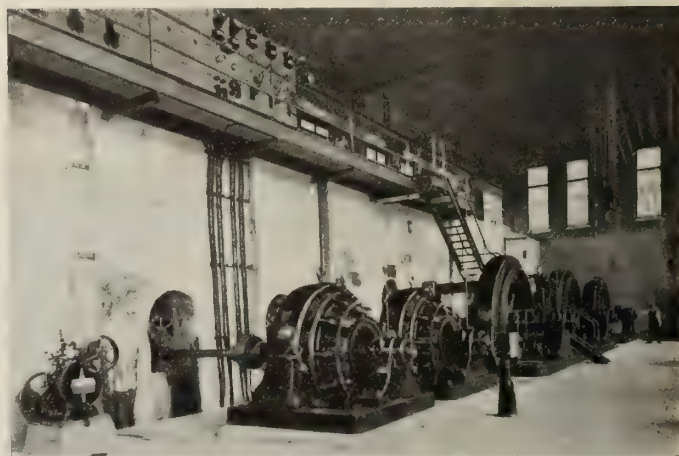
Kenora, Ont., Power House

depending on the height of the water in the river. A regulating dam in the larger, or western, outlet, maintains a fairly uniform level in the lake, but there is considerable fluctuation in the river below the fall between periods of high and low water.

The town of Kenora for several years operated a small hydro-electric plant for lighting the streets and residences, but this had been operating to its utmost capacity for some time, and it was absolutely necessary that a larger plant be built in order to accommodate the growing requirements of the town; and also to furnish an attraction in the way of cheap power, to encourage the establishment of manufacturing industries in this district. A lease of the whole power of the eastern outlet was accordingly obtained from the Ontario Government, and the work of development was commenced on May 1st, 1906, by the town authorities. An unusual feature of this development was the fact that the whole flow of the eastern outlet could be cut off without the necessity of making any provision for handling the surplus water in time of freshets, on account of the availability of the western outlet for carrying the whole discharge of the lake without causing any appreciable variation in level of the water in the lake.

In order to unwater the site of the power house it was necessary to build coffer dams across the stream above and below the falls. The river at this point flowed through a rocky gorge, the cliffs on the west side being almost perpendicular, and on the east side at an angle of about 30 degrees with the horizontal. Accordingly a timber crib coffer dam, about 175 feet long, was built in an average depth of 16 feet of water at a point about 200 feet above the head of the falls. A great deal of trouble was experienced in the construction of this dam

as the current was fairly swift at this location and the cribs were placed on a deposit of gravel and boulders of unknown depth, which washed out more or less and caused very extensive undermining of the cribs. This difficulty was at length overcome by the ingenious expedient of collecting large sections of a floating island, consisting of entwined roots and weeds, which had formed the top of a muskeg and had floated down the lake to a point near the development, and sinking these sections in front of the coffer dam. By this means the leakage through the dam was eventually reduced to small dimensions, and this was taken care of and carried past the construction work through a small wooden open flume and discharged below the lower coffer dam. At this stage of proceedings when the coffer dams were partly installed, an unfortunate delay occurred by reason of the owners of land on each side of the river at this point being granted an injunction restraining the town from proceeding further with the construction works on the plea that the Ontario Government had no right to grant a lease of the water power, as the owners of the land (the riparian owners), had all the rights to the power by reason of their possession of the lands on each side of the stream. All work ceased on June 19th and was not resumed until July 14th, an arrangement between the parties having been arrived at on the previous day. Work was then pushed on in connection with the construction of the lower coffer dam below the power house site. This coffer dam extended from bank to



Kenora, Ont., Power House, Interior

bank across the stream in from 18 to 23 feet of water; and it was 265 feet in length.

About the middle of September the pumping out of the site between the two coffer dams had progressed far enough to allow the excavation to be started. The material that had to be excavated consisted of a bed of boulders and quicksand, having a total depth in some places, of 28 feet before bed rock was reached. The first concrete was placed on October 1st, and the depositing of concrete and the excavation were carried on simultaneously. Considerable difficulty was experienced in connection with the excavation in quicksand as a certain amount of leakage from both the upper and lower coffer dams kept it more or less constantly wet. An-



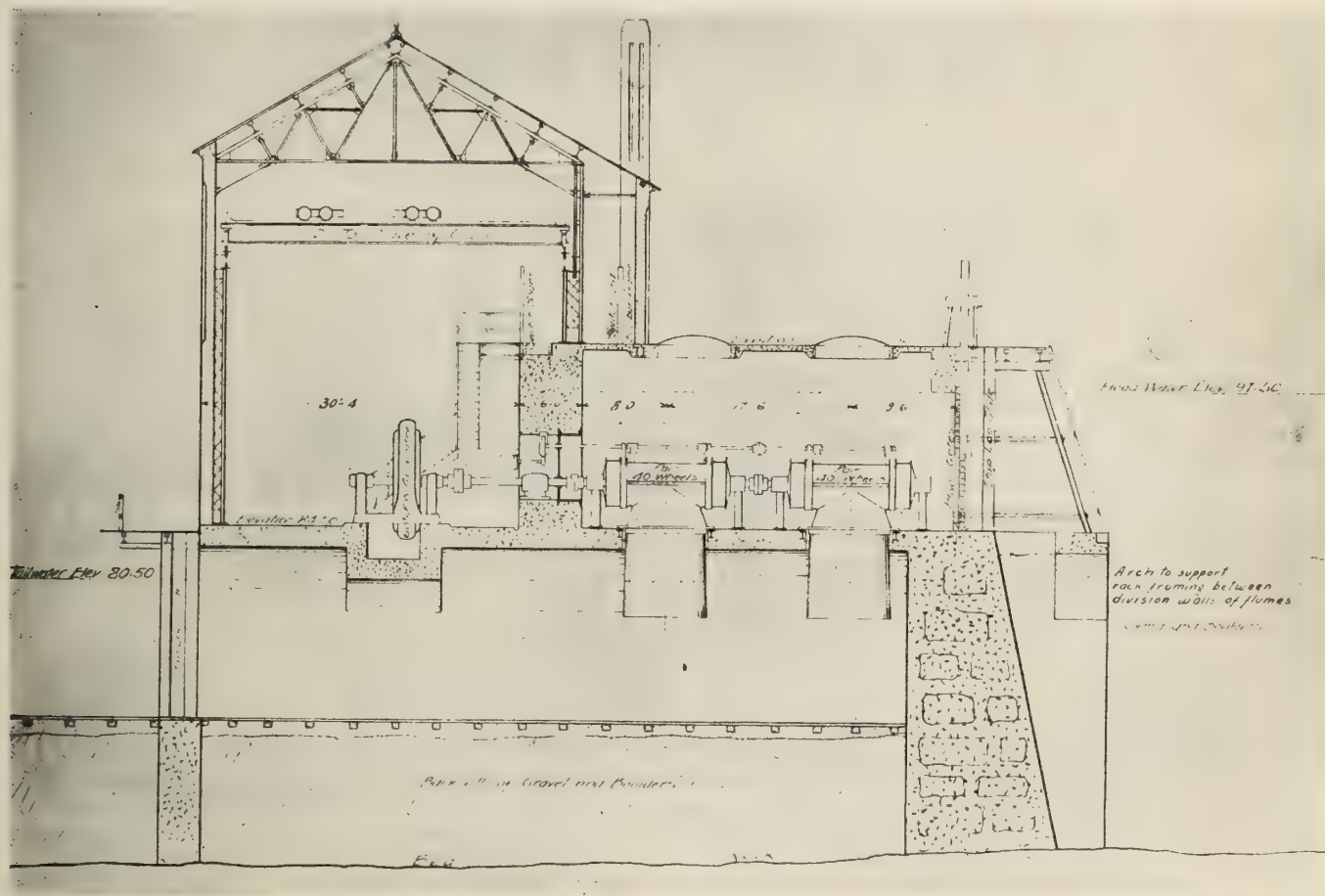
other serious difficulty was that of procuring the necessary kind of labor, as the large amount of railway construction work going on in Western Canada, together with the work of harvesting in Manitoba, had caused the supply to fall short of the demand.

On the last day of November the concrete work was completed. The total quantity placed amounted to about 7,500 cubic yards. The excavation had previously been finished about the middle of November and this work amounted to about 15,000 cubic yards.

The structural steel work of the power house was erected as quickly as the completion of concrete work would permit; and brickwork was commenced on Nov. 10th, but was not completed until Dec. 31st, owing to the intense cold weather which was experienced throughout the month of December. The roof, consisting of 2-

being taken to have about 12 inches of concrete around all large displacer stones. Single horse dump-carts were used to take out the quicksand, and two steam hoists and a hand derrick handled the large boulders and excavated rock.

The site was quite uneven, there being little level ground on which to store materials, so that a great deal of planning was necessary to arrange for a suitable layout of the construction plant and for the disposal of excavated material. The power house extends completely across the stream from shore to shore, and is joined to the rocky banks by heavy concrete walls. Through the wall on the western end of the power house a log-slucice is provided to take care of any lumbering which may require a passage in the future. A typical cross-section of the power house is shown in the accompany-



Kenora, Ont., Power Plant, Typical Cross Section

ply of 1½-inch boards with felt between, covered with a 4-ply felt roofing, was then applied and the building enclosed so as to exclude the weather. The structure was then kept heated to allow of the finishing and placing of machinery to proceed.

Stone for the concrete, which was a very hard trap rock, was quarried in the bed of the river at the site of the falls, where the natural cross section of the stream was enlarged in order to secure greater area and thus reduce the velocity of the water as it entered the forebay. A steam hoist raised the stone in scale boxes to the crushers, where it was broken to 2-inch cubes, and then it was conveyed in dump cars to the concrete mixers, of which there were two in operation on the job. The concrete was all conveyed on runways in wheelbarrows and dumped into position. Large displacers quarried from the site were built in the heavy concrete walls, care

ing sketch. It will be noted that the heavy breast wall, tail race arches, and flume walls are of concrete, while the power house building is of brick with steel columns and trusses, and wooden roof. The building is equipped with a 20-ton hand-power travelling crane, which is provided with two trolleys, each carrying a 10-ton chain block. The rack framing and slides for head gates and stop logs in front of the flumes are of structural steel rivetted together, and were designed to be self supporting during erection and until built into the concrete work. The wheel chambers are covered with a 6-inch slab of reinforced concrete forming a floor, with manholes in same, 7 feet in diameter, for getting at present water wheel units for repairs, and for placing of future turbines. The head gates are of wood, raising in two sections, one in front of the other, with two sets of gates to each flume or wheel chamber. There are



seven flumes 18 feet wide, with 4-foot dividing walls of concrete; the central flume is divided into two equal compartments by a 2-foot reinforced concrete wall, and contains the two exciter wheels, thus providing for six power units and two exciter units. Each flume is provided with a 12-inch cast iron pipe and valve for filling the flume, in order to equalize the water pressure on both sides of the head gates before opening them, and an 8-inch valve for emptying the flume in case of inspection of wheels, or for repairs.

Each hydraulic unit—three of which are now installed—consists of two pairs of 40-inch "Samson" turbines mounted on a horizontal shaft, which is direct connected to the generators through flange couplings. Each unit is guaranteed by the makers to develop 900 H.P. at the generator coupling when operating under a 17-foot head at 150 revolutions per minute. The wheel gates are of the register type, and are controlled by a sleeve ring connected by links to, and actuated by, a single shaft connected to the governor, and carried in bearings on top of the wheel setting or draft chests. The water wheel main shaft and the gate shaft are carried through a heavy cast iron bulkhead, which is provided with stuffing boxes for that purpose, and is set in the concrete wall, which is 6 feet thick, and which divides the flumes from the power house. A heavy collar bearing is set and anchored in this wall, immediately in front of the cast iron bulkhead, and this takes care of any end thrust in the turbine shaft, which in such a setting of right and left hand wheels will be comparatively light. The exciter units, which are two in number, are situated in the centre of the building, each constitutes a single pair of 30-inch "Samson" horizontally mounted turbines direct connected to direct current generators. The large units are each controlled by a type "N" Lombard water wheel governor, and each exciter unit is regulated by a Woodward governor of the compensating type.

The electrical equipment as at present installed consists of three A.C. 3-phase, 60-cycle, 2400-volt generators of the revolving field type, of 625 K.W. capacity each, running at 150 R.P.M.; and two exciters of 175 K.W. capacity each, running at 175 R.P.M. The generators are designed to operate continuously at a load of 500 actual kilowatts at a power factor of 80 per cent. and at a potential of 2400 volts, with a temperature rise not exceeding 35 degrees centigrade, and after a 24-hour run under these conditions are capable of operating for an additional 24 hours at a 25 per cent. increase in load at the same power factor and voltage, with a temperature rise not exceeding 50 degrees centigrade. The lead covered cables from the electrical machines are carried through ducts in the floor and up the face of the bulkhead wall to the switchboard, and thence out through the east gable of the building, where they connect to the transmission line leading to the town, which is approximately one mile from the power station.

The switchboard, which is of blue Vermont marble, consists of 12 panels divided as follows: 5 feeders, one exciter panel, three generator panels for present equipment, and three panels for future generator installation. The switchboard is so arranged that no potential on the front of it is over 110 volts. The switches, bus bars, feeder mains, etc., are carried on an insulated structure nine feet to the rear of the operating board. The rods operating the switches pass through trenches in the concrete floor from under the board to the rear, where the switches are placed. Each generator panel is equipped with ammeter, volt meter and synchronizing receptacles. These are so connected to the synchroscope swinging on an end bracket on the switchboard that by

means of the cross connecting plugs furnished with the board the synchroscope can be made to indicate for any one of the three generators, thus permitting the generators to be thrown together in any order desired. The feeder panels are equipped with three ammeters, as well as the 6-pole, high voltage oil switch, which in time of emergency permits the instant breaking of current in the feeder circuit. The exciter machines are furnished with equalizing pedestal and switch, enabling the excitation of the generators to be thrown from one exciter to the other without even a momentary pause in the operation of the plant.

The cables are all lead covered and are carried through the ducts on corrugated cable racks, and are secured along the wall on their way to the inside cross arms at the east end of the building, on vertical cable racks and specially designed cleats. The choke coils and lightning arresters are placed on the cross arms at the interior of the entrance in the east gable. One large unit and one exciter unit was completed and a temporary switchboard built and the power was turned on on February 9th, 1907, thus relieving the lack of light and power in the town, which had been but poorly supplied by various temporary steam installations throughout the period of construction.

The complete plant has a capacity of 5,000 electrical horse-power, when operating under normal conditions. The town requires for their own use, for lighting the streets, stores, residences, and for operating the pumps of their water works system, about 750 h.p., and the Maple Leaf Flour Mills Company requires 1,000 h.p. This company's new mill, which was completed in the fall of 1907, had only operated a few months when it was unfortunately destroyed by fire. The rebuilding of same, however, has been completed. Their contract with the town gives them the right to demand and use up to 2,000 h.p. The town have still available for manufacturing industries locating in the district, a considerable block of power which they are prepared to lease at attractive figures.

The general designs, plans and specifications for the whole of the work were prepared by T. Pringle & Son, Limited, hydraulic and mill engineers and architects, of Montreal, Que., and the construction was carried out under their supervision. Mr. G. M. Wynn was their resident engineer at Kenora. The contract for the wheel pits and power house, etc., consisting of unwatering, excavation, concrete work, brickwork and general building trades was awarded to Messrs. Kelly Bros. & Company, of Kenora, on a cost-plus-a-fixed-sum basis. The structural steelwork was supplied by the Locomotive & Machine Company, of Montreal, Limited. The hydraulic equipment was furnished and installed by the William Hamilton Manufacturing Company, Limited, of Peterborough, Ont., and the electrical equipment was supplied by Allis-Chalmers-Bullock, Limited, of Montreal, Que.

The firm of J. A. Dawson & Company, electrical supplies, Montreal, have been incorporated under the name of Dawson & Company, Limited. They report that the prospects for spring business are good. Among the orders recently secured is one from the Winnipeg Street Railway Company for heaters and trucks for 30 cars, also vestibule heaters for 30 additional cars.

Mr. F. R. Martin, of Hamilton, Ont., has issued three writs on behalf of farmers, against the Hydro-Electric Commission to set aside leases for land on which to erect power poles. The farmers claim they gave the leases under a misunderstanding.



# Letters to the Editor

## An Interesting Circuit Breaker Alarm

Mr. Elvin F. Brough, Tweed, Ont., sends the accompanying interesting sketch and description of a circuit-breaker alarm:

The electro-magnet (M) and the lamp (L) are connected in series across the power line. The magnet in my case is an old telephone ringer coil. Under the electro-magnet is a pivoted armature, which, when the power goes off the line, falls by gravity and makes connection through a mercury-cup (M.C.) through a battery circuit and a 10-inch bell, a switch being provided in the circuit to stop the bell in case of a shut-down on the line. When the circuit-breaker is replaced the relay armature is again pulled up and the bell stops ringing. While the idea may be old, the cheapness and the ease with which

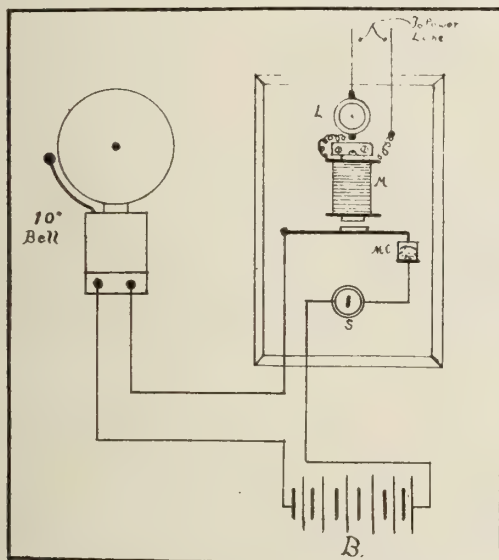


Diagram of Circuit Breaker Alarm.

it is installed may appeal to some of "our brother electricians," as it does away with the bother of drilling the switchboard for a mechanical circuit closer in connection with the breaker.

Mr. Brough has had two of these in operation for nearly two years and they are giving good results.

## The Tungsten and the Carbon

Editor "Electrical News":

I see you have an editorial in the February number which treats of street lighting in general and in the latter part you say: "the carbon incandescent lamp is doubtless about to join in the march to oblivion, for without doubt the tungsten will soon supersede it, more particularly for series work." I will give you my experience.

One of the lamp agents was here in September last, when I gave him an order for a few tungsten series lamps, 75 watts. The agent said: "My dear fellow, you will have these lamps in a few days and have your streets as light as day."

I got notice on the 10th of January that I might expect them any day as they had got as far as Toronto. The box with lamps came on the 15th January by ex-

press, marked "this side up—handle with care." I had this box opened with great care and found one lamp in the midst of cotton batting and excelsior; the box measured 15 inches square and 15 inches deep, and cost 60 cents express. I kept this lamp on exhibit for a few days, but warned visitors not to handle it or look at it too long as it might break. It was put on a bracket near where I had a 32 c.p. carbon lamp and I had some of the committee see this wonderful light. I was disappointed when they asked me which is the one. The tungsten series lamp cost me \$3.20 and burned ten nights, that is at the rate of 32 cents a shine. The carbon lamp cost 95 cents and is still burning. The tungsten lamp will have to do better work than this \$3.20 one, before it will cast the carbon lamp out into oblivion.

Yours, etc.

A STATION MAN.

## The Thetford Mines Award

Editor the "Electrical News,"

In your issue of February, 1909, on page 31, there is an item stating that the award in the controversy between the Shawinigan Water & Power Company, and the mine owners at Thetford Mines, was made in full in favor of the Shawinigan Water & Power Company. Representing the interests of the mining companies, I wish to say that this information is not in accordance with the actual facts. As the arbitration proceedings were carried on as a strictly confidential investigation into the complaints of the mining companies, I would not therefore care to go into the details of the case. I must, however, state that the matter was compromised and settled to the mutual satisfaction of the mining companies and the Shawinigan Water & Power Company.

Yours very truly,

M. A. Sammett,

Arbitrator for the mining companies.

## A Reply From "Live Wire" on the Grounding of Secondaries

To the Editor of the "Electrical News":

Replying to the letter from "Live Wire," which appeared in your February issue, the writer would say that as far as he can judge the matters raised in his letter are most important. Evidently, however, "Live Wire" has been fortunate enough to escape so far, but there is no guarantee for the future, and I would therefore sincerely recommend that he look further into both points, and see whether or no he is not in error. The writer is personally aware of three or four fatal accidents which could never have occurred had the secondaries been grounded, also of at least two other accidents, not fatal, but resulting in heavy damage suits, due to the use of metallic arc lamp suspensions. Mr. Scheible, in his letter, has very clearly expressed his views in the matter. Will not some others of your readers also give us their opinions?

Yours, etc.,

X. Y. Z.

Allis-Chalmers Bullock, Limited, Montreal, have issued bulletin No. 1063, relating to gas engines and generators, 300 to 5000 h.p.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

It is naturally very gratifying, at least it is to us, to be able to say that the number of questions submitted lately has been far in excess of our capacity to handle them. At the same time we recognize that when a question has to remain unanswered for six or seven weeks, as is sometimes the case, we owe an apology to the correspondent in question. Sometimes, when the matter seems to be more urgent than usual, we have sent out answers by mail, feeling that the delay in publication would not then be so material. We trust therefore that those of our correspondents who receive their answers in this way, but whose questions do not appear in our columns for one or two issues, will understand the situation and pardon the delay.

One of the correspondents who lately sent in a communication relating to street railway work made the statement that he and others in his part of the Dominion would be very glad to see more questions on street railway practice. We trust that it is needless to say that we welcome any and all such suggestions for the improvement of the "Electrical News," and, further, that our columns are at all times wide open to letters or questions relating to any part of the electrical industry. We sincerely trust that our readers will avail themselves thereof just as frequently as they feel so inclined.

Question No. 1.—Can you give me some information in regard to the operation of Tungsten lamps on circuits, other than they are manufactured for? That is to say, what is the decrease in candle-power and effect on life, when a 110-volt lamp is used on a 100-volt circuit, and also when a 100-volt lamp is used on a 110-volt circuit; also, does the lamp have the same characteristics on direct and alternating current?

Answer.—There is comparatively little data available as yet on Tungsten lamps, particularly regarding their life. We are therefore not able to answer this part of your question, except to estimate that under the first condition which you name, viz., a 110-volt lamp on 100-volt circuits, the life would be increased by something like 75 to 100 per cent. Burning a 100-volt lamp on a 110-volt circuit would bring the life down to possibly 30 to 50 per cent. of what it would be under normal conditions. Perhaps some of our readers can give more definite information than this.

Regarding the change in candle power, the decrease under the first condition would be 30 to 40 per cent. Vice versa, the increase when burning a 100-volt lamp on a 110-volt circuit would be about 35 to 45 per cent. The Tungsten lamp burns with equal facility on either direct or alternating current, in this respect being quite different from the tantalum lamp, which gives a consider-

ably shorter life on alternating circuits than on direct current.

Question No. 2.—Would you kindly inform me whether it is possible to prevent wharf timber and piles from being destroyed by borers (*teredo navalis*), by electrical connection, and if so, the amount of current and how employed? For your information I enclose the following clipping on this subject: "A valuable and interesting discovery has been made by a wharf builder, Mr. Thos. Prudden, of San Francisco, who was rebuilding an old wharf, in which the piles had been badly destroyed by borers (*teredo navalis*). One pile was found to be thoroughly sound, and a careful investigation of the cause of this exception revealed the fact that the piles had been used to support a live wire. Mr. Prudden then carried out experiments with electricity upon wooden piles, and discovered that the toredo would not bore into a pile in which a very small current was maintained."

Answer.—We are very sorry that we have no information whatever on this subject. We would judge though that the effect of any leakage through a pole would be to maintain a more or less gaseous condition round that surface of the pole which was in the water, besides which there might be a tickling or even more severe sensation experienced by any insect which attempted to come close to the pole. In other words, it would probably get an electric shock, more or less severe, that would tend to keep it away.

However, we would think that the arrangement would be so complicated, and the cost of current and maintenance would be so great, as to render the scheme commercially impracticable, though perhaps some of our readers could give us more definite information on the subject.

Question No. 3.—Does it cause any great harm to a street car to run it over a section break in the overhead wire without turning the controller off?

Answer.—The answer to your question depends upon several conditions, principally the length of the breaker, the speed of the car, and the design of the motors. The trouble that you are going to produce, if you get any at all, will be flashing over of the motors. This is caused by the fact that if you instantaneously apply full voltage to a motor, which is what happens when the trolley wheel comes off the breaker onto the trolley wire, you naturally tend to make a heavy rush of current through the motors. This current makes a very strong armature field, this in turn distorting the magnetism of the stationary field poles, which, of course, means a big shifting of the neutral point, with consequent bad sparking at the commutator, frequently so bad as to flash over from brush to brush. If the motors are built with laminated poles their magnetism will build up quicker than if the poles are solid, and, of course, the quicker their field builds up the less the armature field is able to distort it, and so the less the sparking. Vice versa, solid poles build up comparatively slowly, so that under such circumstances motors of this design are rather more liable to flash over. The faster the speed of the car, or the shorter the length of the breaker, the less time there is for the magnetism of the fields to die away, and consequently the difficulties at the motor are then not so pronounced as in the case of a slower moving car and a longer breaker.

From the foregoing you will see that no very definite answer can be made to your question, though on the whole we would say, don't do it, for, besides the possible effects on the motors, you have the flashing and



burning between the breaker and the trolley wire to consider.

Question No. 4.—Why does an induction motor take so much less current when being started from an auto-transformer than if put direct onto the line, even though the voltage has not been reduced very much?

Answer.—The current taken by the induction motor itself is not reduced in anything like the proportion which it appears to be, for its amperage, that is, the current flowing between it and the auto-starter, is practically in proportion to the voltage delivered to the motor. In other words, if the auto-starter gives 75 per cent. of line voltage to the motor, the motor will then take substantially three-quarters of the current which it would draw if given full line potential. But the current which it receives in starting does not all come from the line, part being furnished by the auto-starter, the winding of which acts as the secondary of a transformer as well as being a reaction coil. In other words, the current between the line and the auto-starter is much greater than between the latter and the motor, hence the popular understanding that the motor is taking much less current than it formerly did, which is not really the case.

Question No. 5.—I hear a great deal about the value of high torque in meters, and so would be glad to have you explain what it is, and why it is so valuable?

Answer.—The meaning of the expression "high torque" is simply large turning or twisting power, in other words, a high torque meter is one in which the turning power of the armature is relatively high, or, to put it another way, one which has a comparatively powerful motor element. High torque has no special value in itself, though it is of great value as an indication of the way in which a meter will retain its original calibration after a considerable period of use. The explanation of this is as follows: The load on a meter, that is, the work which the motor part of it does, consists of two distinct parts, namely, that consumed by friction, and that consumed in overcoming the pull of the drag magnets. If these two factors could be kept the same throughout the life of a meter as they are at the beginning the instrument would maintain its original calibration right along, but as this cannot be done, in that the friction always increases a little, there is always a tendency for a meter to get slow. Seeing then that the friction cannot be kept from increasing, the next best thing, in order to keep its effect down to the lowest possible minimum, is to make it as small a fraction as possible of the total load. This can only be done, however, seeing that the friction has already been brought to the lowest possible point, by increasing the other component of the load, namely, that consumed by the drag magnets. But this, of course, cannot be done unless you correspondingly increase the driving power, in other words, unless you make the meter of high torque. Hence we see that a high torque meter, other things being equal, is more likely to retain its original accuracy than one of lower turning power.

### Bankers are Anxious to Lend Money

"Money is so easy now," says a Montreal paper, "that bankers are beginning to protest when brokers pay off their loans.

"The other day a broker paid off a large loan with a bank, and the banker called him up over the 'phone:

" 'Why are you paying us off?' asked the banker.

" 'Because I don't need the money,' replied the broker.

## C. E. A. Convention at Quebec

The result of the vote of the members of the Canadian Electrical Association as to the place for holding the 1909 convention, was that 209 replies were received. Of these Quebec received 44, Niagara Falls 39, and Ottawa 35. The Managing Committee have therefore decided upon holding the convention in Quebec, and the dates selected are Wednesday, Thursday and Friday, June 16th, 17th and 18th. Mr. E. A. Evans, general manager of the Quebec Railway, Light & Power Company, has consented to act as chairman of the local committee, and Mr. A. A. Dion, of Ottawa, as chairman of the paper committee. A special committee on transportation has been appointed with a view to securing favorable terms from the railway and steamship companies. A splendid convention in the Ancient City may be anticipated.

The following committees have been appointed and will have interesting reports to present at the convention:

Committee on Theft of Current—Messrs. J. M. Robertson, Montreal (chairman); R. G. Black, Toronto; H. O. Fisk, Peterboro.

Committee on Statistics—Messrs. W. A. Bucke, Toronto (chairman); John Murphy, Ottawa; W. L. Adams, Niagara Falls.

Committee on Grounding of Transformer Secondaries.—Messrs. R. S. Kelsch, Montreal (chairman); J. G. Glassco, Hamilton; W. G. Chace, Winnipeg.

Committee on Meter Inspection and Testing.—Messrs. A. A. Dion, Ottawa (chairman); J. J. Wright, Toronto; R. S. Kelsch, Montreal; J. M. Robertson, Montreal; A. A. Wright, Renfrew.

### Lecture on "The Oscillograph"

The electrical section of the Canadian Society of Civil Engineers held an interesting meeting on Feb. 12th in the Macdonald Engineering Building, McGill University, Montreal. The event of the meeting was a paper by Mr. J. A. Johnson, engineer of the Ontario Power Company, Niagara Falls, on "The Oscillograph." The meeting took place in the college buildings instead of the society's room in order to obtain the electrical apparatus necessary to give a practical demonstration of the oscillograph. Mr. Johnson first dwelt on the origin and development of the oscillograph and then illustrated by numerous slides the two types in use, viz., the strip type and the loop type. A number of oscillograms were shown, giving various views of different phenomena, to the study of which the oscillograph is particularly applicable.

A number of experiments with the oscillograph itself were carried out and proved extremely interesting. The following is a list of some of the experiments performed:

Electro-motive force wave from different machines, single, two and three-phase; electro-motive force and current waves in circuits containing resistances, reactance and condensance; tests showing the establishment of current in carbon and tungsten lamps; potential and current waves in synchronizing alternators; initial rush of current on charging transformers, and others. In the absence of Mr. R. S. Kelch, president of the section, Professor L. A. Herdt, of McGill University, presided. The attendance was large and the interest taken by the members present showed their appreciation of this interesting lecture.



# TELEPHONE TOPICS

## A Harmonic Rural Telephone System

In many of the rural telephone systems there is one very serious disadvantage, namely, that the operator cannot signal the subscriber secretly, but must resort to a coded ring, thereby informing all the parties on the line that one of the subscribers is being called. Many persons are convinced that the ideal system would be one in which the subscriber can signal central, and the operator call the subscriber without in any way informing the other subscribers on the line that a connection is desired. This kind of a system is feasible when it is desired to place a limited number of subscribers on the line. Practice and experience seem to indicate that four is the maximum number of telephones that can be placed on a grounded line when the above stated conditions are desired, and that eight is the limit for a metallic circuit. A scheme which is frequently utilized in accom-

it has been found practical to wind the low frequency ringer to a resistance higher than the other three.

The trouble that has to be guarded against most in this kind of a system is interference, which is the responding of more than one ringer to any one frequency. This is very often due to a poor adjustment of the ringer, or the using of a ringing current which is not of the particular frequency for which the ringers are tuned, but some intermediate frequency capable of affecting to some extent two or more ringers on the line. Then again, harmonics established in the generating of the ringing current and superimposed upon the regular ringing wave might aid in bringing about the above-mentioned trouble. The difficulty of interference due to harmonics has been reduced to almost a minimum by the insertion of a 1 microfarad condenser in the ringer circuit, as shown in fig. 2. It will be noted that when the receiver is off

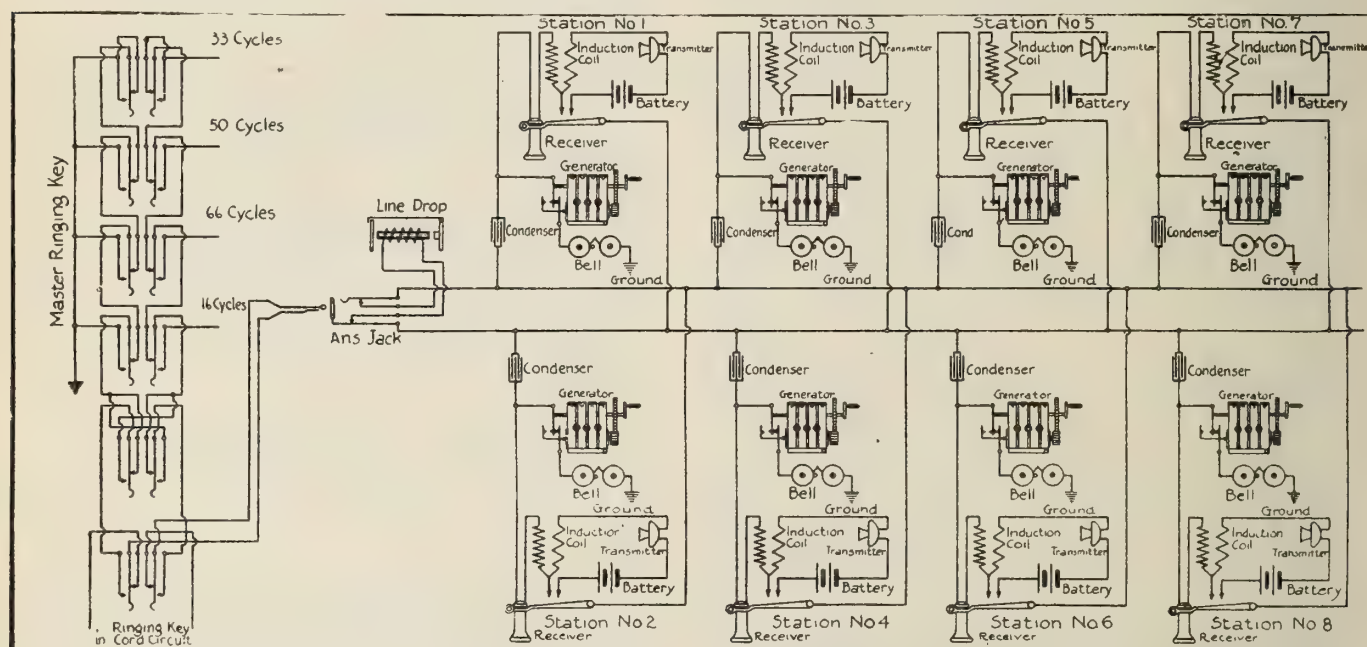


Fig. 1 Diagram of the Circuit of the Harmonic Scheme applied to a metallic line to which eight instruments are connected.

plishing these results is the ringing system, using alternating currents of four different frequencies, with one bell tuned to respond to each frequency.

In fig. 1 is shown a circuit in which the scheme just referred to is taken advantage of. It will be noted that the ringer in each case is bridged directly across the line, but since they are so designed as to respond to an alternating current of a particular frequency only, the operator can readily select any subscriber on the line by placing on the line ringing current of the frequency for which his bell was designed. The frequencies ordinarily used in these systems are 33, 50, 66 and 16 cycles, for 1st, 2nd, 3rd and 4th parties respectively. The design of the ringers is special to the extent that the tapper is rigidly fastened to a reed whose natural period of vibration corresponds to the frequencies mentioned above, the tapper itself being a weight which can be adjusted so as to approach almost exactly the period of vibration desired. Consequently, the only difference in these ringers is in the weight of the tapper, the low frequency having the lightest weight, the other two frequencies ringing in correspondingly intermediate steps. Then again

the hook this condenser is still in circuit, but as it is of large capacity it does not interfere with the passage of ringing current. If the results above referred to in regard to avoiding trouble due to neglect to hang up the receiver are desired, a second condenser of one-half microfarad capacity must be inserted in the receiver circuit.

There is one other condition, of the same order as interference, which must be guarded against in magneto systems of this type. A standard hand generator operated at the customary speed will generate a current approximating very closely to 16 cycles. Consequently, if the circuit is not properly designed a subscriber upon signalling the exchange may actuate the 16-cycle ringer. In the circuit shown this condition is avoided, since the line drop is wound to but 100 ohms, and therefore the generator current will seek a path through this low-wound drop in preference to the path through the high-wound ringer and the condenser, the latter offering a considerable resistance to current of this frequency.

Fig. 1 shows the harmonic scheme applied to a metallic line on which eight instruments are installed. In



this case a ringer of each frequency is connected from both the tip and sleeve sides of the line to ground, and consequently we have a line on which eight telephones are operated, each of which is rung selectively. In case it is expedient to place more than eight telephones on the line a semi-selective system can be resorted to and 16 telephones can be installed. In this system four telephones of each frequency are bridged across the line, and the ringers of two instruments are connected from either side of the line to ground. Accordingly two ringers will respond whenever any subscriber is called, and the stations have to be divided so as to respond to coded signals of one and two rings.

For rural telephone instruments simplicity of construction of parts and their assembly is of the utmost importance. The more complicated the wiring and apparatus used, the greater are the chances for trouble, and consequently a heavy maintenance expense ensues, as well as many complaints of poor service. Very often complicated apparatus is installed with the idea of improving the service, while, in fact, it tends to bring about just the opposite results. In considering the purchase of telephones, the main thing is not the first cost. It is far better to think of the frequency with which the

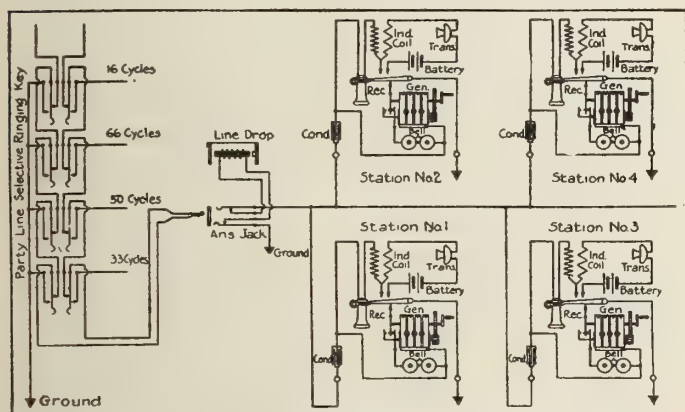


Fig. 2—Diagram of circuit illustrating the use of four-frequency systems for selective signaling

troubleman will be called upon to make an expensive trip in order to make some minor adjustment which has put some telephone, or even the entire line, out of commission. The length of time a line will be out of service due to trouble, and the number of times the subscribers on such a line will tolerate discontinued service before ordering the telephone removed, are questions to be weighed with great care when the telephone manager is contemplating the purchase of rural instruments. The apparatus which should be awarded the greatest consideration in the equipping of a rural line is the apparatus which will furnish the best uninterrupted service—service that can be had at any hour during the day or night. First of all it is his duty to see that the service is continuous, and then add any other desirable improvements, but never let the improvements impair the most essential feature: “continuous, efficient service.”—G. A. Joy and J. B. Thiess, in the American Telephone Journal.

### New Rates for New Brunswick Company

The New Brunswick Telephone Company have put in force a new schedule of rates. The principal change is to reduce the five minute conversations to three minutes. For every minute over three the user will pay extra—that is to say, the extra charge begins now when three minutes have elapsed instead of when five minutes have elapsed as formerly. In a circular to its employees

the company makes a long statement regarding the new tariff, the substance of which is as follows:

“The New Brunswick Telephone Company is issuing a new tariff book of rates for long distance messages over its system. This is the first schedule of rates issued by the joint companies since the merger in 1906, and the need of it has been long felt. Existing rates in this province have been based on no particular principle and have been entirely lacking in any approach at system or uniform treatment to different localities. By reason of not having a recognized toll tariff the long distance lines of the company are loaded with inquiries from operators in small exchanges asking those in larger centres for verification of rates, resulting in poor service to patrons and a confusion in charges.

“The new toll tariff is based upon the latest recognized system of telephone routine and charges. The province has been divided into blocks, all places within each block taking the same rate to the rest of the province, and all charges being based upon a mileage schedule. The block rate is the principle upon which the telegraph and express companies base their charges, and after many experiments, telephone companies have adopted it. Air line measurement, except in a few exceptional cases, has been used in measuring distances, the old-time idea of taking the pole or wire mileage having been found to make rates in some places prohibitive. The new rate is designed to give uniform treatment to all commercial centres and will mean many changes from the old con- change is in no sense an increase in rates, but is a read-justment that had become an absolute necessity by reason of increase in traffic, congestion of the lines and the need of uniformity and system to make business run smoothly.

“Following the line of all other large operating companies, the N. B. Telephone Company, Limited, will, with its new tariff, inaugurate a three-minute schedule. All intercourse with the Maine & Quebec Telephone Companies has for years been on this basis, and, commencing with the new year, the Nova Scotia Telephone Company will adopt the same schedule. Carefully compiled telephone statistics in other companies show that 80 per cent. of the long distance messages are under three minute duration, and a careful checking of the N. B. Telephone Company’s business for some months shows that the average length of conversation over its system is three minutes twenty-four seconds.”

### Telephones for C.P.R. Despatching

Mr. B. S. Jenkins, general superintendent of Canadian Pacific telegraphs, in reply to an enquiry regarding the report that the company intended to build a telephone line from Winnipeg to Brandon for the operating of trains, made the following statement:

“During the last few years great improvements have been made in telephone apparatus with the result that uses can be made of it which were not possible in earlier years. During the last three years the Canadian Pacific, with other roads, has been making experiments in the use of the telephone for train despatching. Early last season telephone equipment was supplied to the line from Montreal to Farnham, a very busy section, and the success of the test was so marked that the equipment was continued to Newport. Early in the year Mr. Whyte, who keeps in the closest touch with all new developments, requested from me estimates for certain sections of western lines. As a result, appropriations were secured for the immediate installation of telephone equipment on two important sections, namely, from Winnipeg to Brandon, 133 miles, and from Swift Current to Medicine Hat, 150 miles. Heavy copper metallic circuits



will be provided, two heavy copper wires being strung on each section. These circuits will be entirely self-contained, the signalling and talking all being done on the same pair of wires. Semi-automatic selectors will be used for signalling, which will enable despatchers, merely by the depression of a couple of buttons, in connection with a series of synchronous clocks, to ring at will vibrating bells in one or more offices on the line. This has been found to be a less laborious method of calling an operator than the use of the telegraph and the saving in time has been very great. In each of the local offices a four-inch vibrating bell, large enough to be heard at a considerable distance, is installed, and when this bell is rung without warning, the one thought of the operator is to shut it off and the call is answered immediately. In practice it has been found that, in order to forestall the despatcher in the ringing of the bell, the operator will report the train the instant it has passed.

"In handling train orders by telephone the same method is used as with the telegraph. The use of the telephone is very quick and flexible, and the despatcher is able to get much more detailed information with reference to what each train is doing. He can talk personally to the conductor and the engineer, and is brought much nearer to the train movement.

"An obvious advantage of the telephone train operation is found in the fact that any person can use the system, while only the trained telegrapher can use the key. I have no doubt that for train operation the telephone will supersede the telegraph, but for the transmission of commercial or business telegrams where a record is required, the telegraph will continue to hold the field. As an illustration of this fact, the telegraph company is called on daily to transmit telegrams confirming agreements and contracts which have been arranged by telephone."

On being asked why the railway company were installing the telephone wire west of Winnipeg on the single track, rather than east of the city on the double track, Mr. Jenkins made the interesting statement that although, in theory, it had been supposed that a telephone would be of much greater use on a double track than a single track, it had been found by actual experiment that while the telephone was of great value on a double track, it was of still greater value when the traffic was confined to a single track.

## Personal Mention

Mr. C. B. Buck, of Dawson & Company, Limited, Montreal, is at present on a business trip to Winnipeg and the West.

R. H. Mulock, of Winnipeg, a former McGill student, has won the prize given by the Canadian Society of Civil Engineers for the best essay on "Problems of Electrical Engineering." Mr. Mulock's essay was on the subject of "Synchronisms."

Mr. A. J. Richards, manager of the Alberta Government telephone system at Edmonton, was recently appointed to succeed A. E. Morrison, superintendent of Government telephones at Calgary, who resigned to accept a position in Minneapolis.

Mr. Kenneth L. Aitken, electrical engineer for the city of Toronto, was married on February 10th to Miss Anna E. Regan, of Toronto. The bride and groom spent a week and a half in New York on their honeymoon.

The "Electrical News" joins with Mr. Aitken's friends in wishing him and Mrs. Aitken a full measure of happiness.

## An Awkward Situation in Winnipeg

Mr. R. S. Kelsch, consulting engineer, Montreal, has designed an underground conduit system for the Winnipeg Electric Railway Company, and has purchased and delivered in Winnipeg some 30 carloads of vitrified clay conduit. On Wednesday morning, Jan. 20, a large force of men started to tear up the streets for the purpose of laying a conduit system. The work proceeded all day without any interruption, but on the following morning at 10 o'clock a large force of policemen appeared and the company were forced to stop work.

Last summer the City Council of Winnipeg passed a by-law, No. 5430, which required that all wires operated by the company were to be placed underground in a certain area of the city set out in the by-laws. The notice received by the company as the result of the by-law was as follows:

"Take notice that all telephone, electric light and electric power poles shall be removed from off the streets and lanes of the city of Winnipeg, and all telegraph, telephone, electric light and electric power wires shall be placed underground within the area described in section one of by-law 5430, a certified copy of which is hereto annexed, on or before the 1st day of August, 1909, excepting street lighting poles and railway trolley and span wires, and further take notice that should you refuse or neglect to comply with the order of the Council by the said first day of August, 1909, then any license, permit or privilege granted to you or assumed to be exercised by you, is forfeited and cancelled, and the officers of the city shall cut down and remove such poles and wires as then remain upon or above the streets and lanes of the said city, not coming within any of the exceptions enumerated in said by-law No. 5430."

This notice is signed by Acting-Mayor Harvey and City Clerk Brown.

When the company notified the city of its intention to proceed with the work of putting the wires underground, the city solicitor at once pointed out to the Board of Works that if the company wished to use the city's streets for conduits it should be forced to make some agreement with the council to govern such use of the streets. The company's letter regarding the conduit was then referred to the city solicitor. Since that time the city has given the company no authority outside of that contained in the by-law to put the wires underground.

The position now taken by the city is a remarkable one. After ordering the company to place their wires underground, and after the company purchased a large amount of underground material and commenced work, they are notified that they must make arrangements to obtain permission to use the streets before they can proceed. The city claims that the company requires a permit to do this work in addition to the order contained in the by-law.

A new device has recently been introduced on the tramway system at Rebusburg, which is intended especially to reduce the wear of the trolley wire on curves. By means of special tools a sheath of hard copper sheet, 1 mm. in thickness, is pressed round the trolley wire in lengths of 1 m., so that the seam is on the upper side. These sheaths can easily be removed when they are worn through.



# In the Courts—Recent Interesting Cases

**The Hydro-Electric Appeal.**—The reasons of the Divisional Court of Ontario for dismissing the appeal of the city of Toronto and city of London from the judgment of Mr. Justice Latchford, refusing to strike out the pleadings of the ratepayers who are suing the two cities to set aside the contracts entered upon with the Hydro-Electric Commission have been delivered.

The Court holds that no pleading should be struck out unless it is obviously unsustainable, or discloses no cause of action at all. So far from that being the case in the suits under the Court's consideration, they appear to disclose causes of action, substantial in character, and such that it would be quite unjustifiable to summarily terminate the plaintiffs' rights and prevent them from prosecuting their actions by orders that might preclude their obtaining the opinions of such an appellate tribunal as the Supreme Court of Canada, or the Judicial Committee of the Privy Council.

Regarding the point urged by the municipalities that the Hydro-Electric Commission should be made a co-defendant, the Court considers that in view of the absence of a declaration by order-in-Council that the contracts are binding on the commission, it is questionable whether that body should be regarded as a party which ought to be brought before the court in either action.

Continuing, Mr. Justice Anglin said: "But assuming that contracts do exist, which should be dealt with as binding upon both the municipalities and the commission, the present appeal should not in my opinion succeed. The plaintiff in each case has done all in his power to bring in the commission as a defendant. It refuses to consent to be joined, and the present defendants insist that it cannot be joined without the fiat of the Attorney-General. These defendants strenuously and successfully opposed the plaintiffs' application for such a fiat. Assuming the validity of such legislation requiring this fiat and its applicability to the present case—points which the plaintiffs contest, but upon which we deem it inexpedient to express an opinion—its effect is to withdraw the Hydro-Electric Commission from the jurisdiction of this court.

"Although no co-contractors are regarded as parties whom a defendant is entitled to join, it is held that where a co-contractor is necessary to the continuance of the action that he should be joined as a defendant. The commission may be regarded as placed without the jurisdiction of this court. A defendant moving to stay for non-joinder of another party as defendant should show that the latter is within the jurisdiction.

"Unless the present plaintiffs are to be allowed to proceed with their action without joining the commission as a defendant, whatever right they may have against the defendants before the court will be in effect denied them.

"When, as here, through no fault of their own, the plaintiffs are unable to bring before the court parties who are admittedly proper parties, and parties who ought to be joined if it is reasonably possible to join them, they should not, because of their inability, be prevented at this stage from further proceeding with their action.

"At the same time it should be left open to the defendants at the trial to insist that no judgment should be pronounced against them in the absence of the Hydro-Electric Power Commission.

"By leaving the matter open to be dealt with in the judgments at the trials, there is no reason why this question, with the other questions involved in these important actions, should not be carried on appeal to the Supreme Court of Canada or to the Judicial Committee of the Privy Council. That risk the plaintiffs must assume."

**Taxation of Transmission Lines.**—The City of Westmount has entered suit against the Montreal Light, Heat & Power Company for \$5,027. The amount claimed is for three years taxes on electric transmission lines and gas mains. The Light, Heat & Power Company claim that this property is not taxable and the former action which was entered against the company is now before the Court of Appeal. The City of Westmount claims that this property should be classified as real estate, and as such is taxable. The company assert that the property is immovable, and, therefore, exempt from taxes. The same principle applies to the second action which was taken in order to prevent its being proscribed.

**Heavy Damages Against Electric Railway.**—A verdict of \$30,000 against the Ottawa Electric Company has been given by an Assize Court jury in favor of Edward A. Bredenberg, the London mining engineer who was injured in the Britannia line accident near Ottawa last May. Mr. Bredenberg had his leg amputated. He claimed \$50,000 on the ground that being a mining engineer in the Yukon at a salary of \$6,000, he was unable to continue his profession, and his earning power was lost.

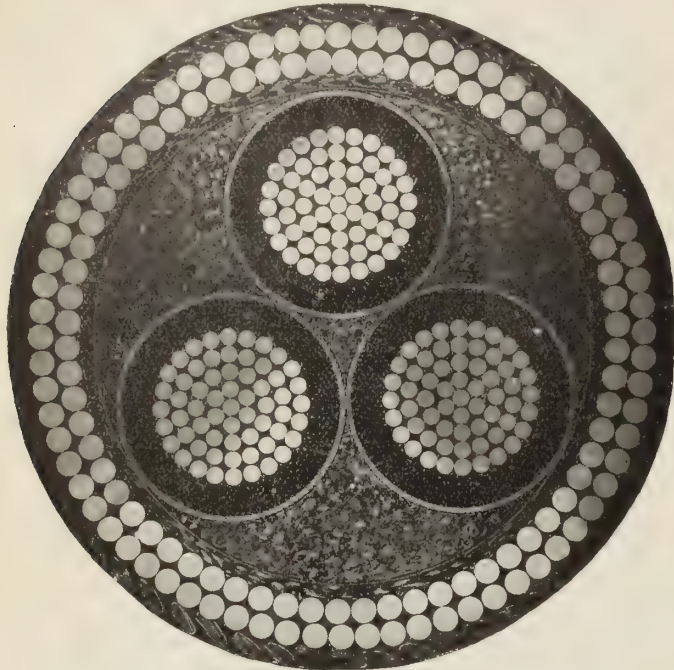
**The Meaning of Horse Power.**—A writ has been issued in a formal suit brought by the Attorney-General of Ontario and the Commissioners of the Queen Victoria Niagara Falls Park against the Electrical Development Company to recover \$17,247.58 for excess of horse-power over 10,000. A similar action was brought recently by the same plaintiffs against the Canadian Niagara Power Company for \$15,217.97. The object of the action is to obtain a construction of the agreement between the province and Park Commissioners with the company as to the supply of power generated at the Falls by the company, especially as to the interpretation of the clause dealing with the rental payable, and as to the meaning of "horse-power." Up to 10,000 horse power a flat rate is payable, and beyond that a rate per horse power. The company contends that "horse power" means horse power hour, and is to be averaged. The Government and Commissioners contend that it refers to the capacity developed.

**Valuation of Street Railway.**—The Court of Appeal has given judgment in the case of the Town of Berlin and the Berlin and Waterloo Street Railway Company, which arose out of the award of \$75,200 by the board of arbitrators appointed by the parties to value the appellants' electric railway, upon its assumption by the respondents, the Town of Berlin. The court was of the opinion that the award should be set aside and the matter remitted to the arbitrators for reconsideration, the costs of the appeal to be paid by the respondents. The appeal was brought because of the refusal of the board to ascertain the net earnings of the company and capitalize them, as a means of determining the value of the company, and also because nothing was allowed for the company's franchise.



## A Huge Colliery Transmission Cable

The illustration published herewith is of a large colliery cable, recently manufactured by Messrs. W. T. Henley's Telegraph Works, Company, Limited, of Blomfield street, London, E.C., who make a specialty of the manufacture of mining cables. The cable is of



Three Core, Three Phase, Colliery Cable 380 yards long.

the three core type, for transmitting three phase current down the shaft of a mine at a pressure of 500 volts, each conductor being of .4 square inch section, composed of 61 tinned copper wires, each .092 inch in diameter, insulated with vulcanised bitumen to a diameter of 1.168



View of Drum for Delivery of 380 yard Cable.

inches, making a total thickness of insulation between cores of .340 inch and between any one conductor and earth of .170 inch, covered spirally with two lappings of taping, the three cores then laid round a centre with

wormings, again taped, heavily braided and compounded, armoured with two layers of galvanized iron wires, each wire .128 inch in diameter, served overall with tarred yarn and waterproof compounded to a diameter of  $3\frac{1}{2}$  inches. The breaking strain of the completed cable is 50 tons.

The cable was manufactured and delivered in one length of 380 yards for suspension down one of the shafts of the Dechmont Colliery, owned by Messrs. A. Russell & Company, Limited, to the order of Messrs. G. Harland Bowden & Company, of Manchester. The drum used for the delivery of the cable, from Messrs. Henley's works, to the pit mouth, which is also illustrated, measured 9 feet high by 5 feet 6 inches wide, the total gross weight, including the cable, being  $8\frac{1}{2}$  tons.

## New Type of Illuminated Electric Signs

The Flexlume Sign Company, Limited, St. Catharines, Ont., referring to their new type of illuminated electric signs, say:

"We have been working for years to develop a sign which will have the brilliancy of the bulb signs without their defects. We claim that our latest type "A" Flexlume letters, which we are now manufacturing in sizes



Type "A" Flexlume Sign Installed on Queen St. West, Toronto.

from 6 inches to 24 inches, inclusive, have reached this goal.

"In our type "A" letters, instead of using many lamps from which a great deal of the light is wasted, in order to light the letter, the entire light of but one lamp per letter is used. This light is so distributed and concentrated by powerful reflectors that the letter is uniformly and brilliantly illuminated. The letters are raised or in relief, and are moulded of glass with prisms on the under surface. Letters are in one piece without joints.

"All the lamps, electrical parts and reflectors are enclosed from the weather and dirt, so that there is no trouble from grounds developing, and the brilliancy of the sign is permanent. The prisms under the surface of the glass letters reflect the daylight brilliantly, and as dirt and soot can find no lodging on the smooth outer surfaces, the day appearance will always be bright and attractive. The letters are excellent for single-faced signs over a store front, taking up no more space and

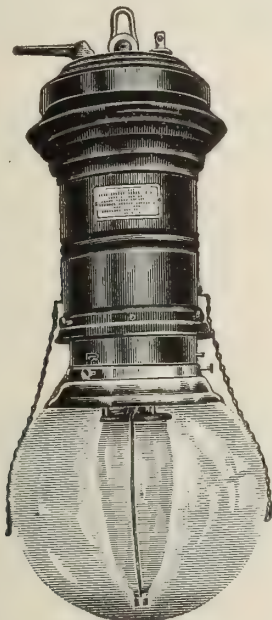


giving as beautiful an appearance in the day time as the common raised gold letters, while at night the sign is brilliant and legible, compelling the attention of every one passing by.

"The greatest feature to commend these signs to the public is their extremely low current cost, giving great brilliancy and legibility. Flexlume letters use only one lamp per letter, instead of 7 or 8, and the saving in current and lamp renewals at the very least is 75 per cent. In an average sign using 12-inch letters we claim that the saving per year on current alone amounts to not less than \$75.

### Reducing The Ballast Loss For Arc Lamps

The electric arc is unstable, and in order that a lamp may burn steadily, it has been found necessary to introduce resistance in series with the arc to act as a ballast. With an ordinary lamp burning on a 110-volt



Continental D.C. 110 Volt Arc Lamp.

circuit, the amount of ballast necessary is such that only 80 volts difference of potential, is across the arc itself and 30 volts is absorbed in the ballast. This represents a loss in efficiency of nearly 30 per cent.

Many efforts have been made to eliminate all or part of this loss, and the makers of the Continental Lamp claim to have accomplished it. In this lamp the spools which operate the clutch have two windings, one winding being of relatively small wire in series with a small amount of resistance, thus making this circuit of high ohmic resistance and little inductance. The other winding is of relatively coarse wire in series with what is practically an inductance coil, thus giving this circuit little resistance but great inductance.

These two circuits are connected in shunt and the current upon entering the lamps, divides according to the well defined laws governing the current flow of such circuits. It must be kept in mind that the inductance coil does not impede the flow of the current while the current is flowing at any fixed amount, but if the current should suddenly tend to increase, the inductance coil will impede the increase of current, and should the current tend to decrease, the coil will act in the reverse direction. Instead of losing 30 per cent. in resistance, it is possible to operate these lamps with 97 volts at the arc with 110 volts at the terminals and have an absolutely steady light. This is a gain of 15 per cent. in efficiency of the lamp, but in addition to this increase

of efficiency, there is also an increased efficiency from the arc itself, due to the greater length of the arc which permits more light to emanate from it.

The Continental lamp is designed particularly for direct current, constant potential service of 100 to 125 volts, 3 to 8 amps. capacity. The arc voltage is adjustable according to the line voltage. For instance, with 113 volts at the terminals, the arc voltage will be 100. The new lamp has self-contained reactance, but separate reactance can be furnished when desired.

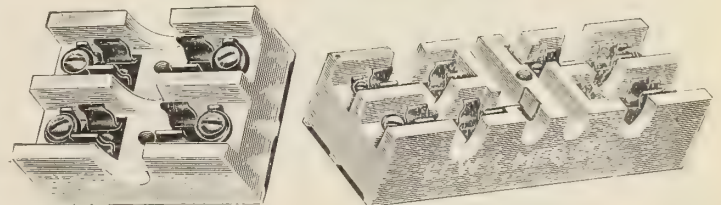
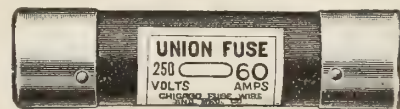
This lamp is made by the Helios Manufacturing Company, who have not until recently made any effort to invade the Canadian market, but their lamps are well known in the States and are used extensively by the principal departmental stores, such as John Wanamaker, Koch, of New York; R. W. D. Reid Bros. Company, of Cleveland. Many thousands are also used by the U. S. Steel Corporation and other large industrial concerns. Mr. A. H. W. Joyner, of Toronto, is the sole Canadian representative.

A prominent feature of the Helios lamp is the peculiar shape of the inner globe, whereby, it is claimed, some five to ten per cent. increase in light emittance is obtained and the detail construction of the entire mechanism which results in a remarkably strong and rugged lamp, very simple to handle and having a low maintenance. It is claimed that the life per trim of standard 12-inch carbons is 20 per cent. greater in the Helios lamps than in other arc lamps, due to careful attention in the design of the gas cap and associated parts.

### A Good Line of Fuses

The Central Electric & School Supply Company, 36 Adelaide street west, Toronto, have ready for mailing an attractive catalogue describing the "Union" enclosed fuses and fuse blocks, open link fuses, and tested fuse wire manufactured by the Chicago Fuse, Wire & Manufacturing Company of Chicago and New York.

The Chicago Fuse, Wire & Manufacturing Company have spent much time and money in carefully investigating from every standpoint the enclosed fuse proposition, and have developed, in their 20 years experience, a line of these fuses which they claim combines every desirable feature that it is possible to embody in a self-



Types of C. F. W. & Mfg. Coy's Fuses.

contained protector. They have withstood most favorably the severest tests prescribed by the Underwriters' National Electrical Association, as well as rendered perfect satisfaction to superintendents and engineers of electric power and lighting companies in many parts of the United States and Canada.

The N. E. Code Standard line of Cartridge Fuses are constructed in strict conformity with dimensions specified by the National Electrical Code. The Central Electric & School Supply Company keep a large stock of these lines on hand for prompt shipment.



# Current News and Notes

## Belhaven, Ont.

Permission has been given to Dr. Greenwood, of Sutton, Ont., to construct a telephone line from Sutton to Ravenshoe.

## Belleville, Ont.

At a recent meeting of the city council a proposition was made from a prominent firm of New York capitalists proposing the establishment of a city and suburban line, extending from Belleville to Trenton, through Trenton to Prince Edward County, from that county to this city, from here to Shannonville, passing the two big cement works, from there, through Thurlow into Corbyville, through Corbyville to this city. Assistance will be asked from the city, and the company promises to spend \$800,000. The matter is in abeyance.

## Brockville, Ont.

M. W. Beach, of Iroquois, accompanied by Mr. Gilmour, electrical engineer, of Toronto, was in town recently in furtherance of a plan to transmit power from Iroquois to Brockville. Mr. Beach wants to build a transmission line and to supply the water department with power. The line would pass through Prescott and Cardinal, and negotiations are being conducted with these places. No decision has yet been arrived at by the local Board of Trade.

## Calgary, Alta.

Engineers' estimates show that the municipal electric railway system to be constructed here this spring will cost \$478,000.

Tenders were received until February 18th by H. E. Gillis, City Clerk, for the supply to the city of one 500 kw. generator, connected to a 750 h.p. high speed engine for railway system, with condenser, switchboard, etc.; also for 3 water tube boilers, equivalent to 1,000 h.p., with piping and induced draft system for 2,500 h.p. Plans and specifications at office of City Engineer.

Tenders were received by H. E. Gillis, City Clerk, until February 18th for supplying to the city the following street railway material: 397 long tons No. 80 A.S.C.E. steel rails; 746 long tons No. 60 A.S.C.E. steel rails; together with certain special work, also spikes, bonds, tie plates. Also angle irons, track bolts, ties, etc., 12 standard street railway cars, one street railway sprinkler, and one street railway sweeper. Overhead construction—Steel span wire poles, 30 feet and 35 feet, three sections; cedar poles, 12.5 miles of 2.0 trolley wire, 10.2 miles of 3.0 feed wire, span wire, hangers, insulators and conical strain insulators, ears, cross-overs and trolley frogs.

## Campbellford, Ont.

The Seymour Power & Electric Company are placing contracts for the construction of a power house at Campbellford which will develop 4,000 horse-power; contracts for the important machinery have already been made with the Canadian Westinghouse Manufacturing Company, the Canadian General Electric Company, Wm. Kennedy & Sons and the General Electric Company, of Sweden. Engineers, Smith, Kerry & Chace, Toronto.

## Cobalt, Ont.

A plan is under way for the development of power for the operation of Cobalt

mines. Smith, Kerry & Chace, of Toronto, are working on the scheme, and it is reported that \$1,000,000 will be spent upon it. Cobalt is at present supplied with steam power at \$125 per h.p., and the new project will supply it at \$50 per h.p. A Dominion charter will be obtained and two water powers will be developed. It is calculated that about 15,000 h.p. will be needed in the mines in Cobalt.

## Dawson, Yukon.

The owners of the Sourdough Mine, 40 miles from this city, propose to buy the local plant and supply light, power and telephones to the whole district.

## Edmonton, Alta.

The managers of the municipal electric light plant contemplate installing an additional 1,000 kw. generator and engine. A. W. Ormsby is Superintendent.

The City Council has decided to build an additional 5 miles of track at once on the line of the Edmonton Radial Railway. R. R. Keely is general manager.

## Fairville, N.B.

A contract has been signed between the street railway and a deputation of councillors from the parish of Lancaster, N.B., for the installation of a lighting system in Fairville. It provides for seven arcs to be placed along Main street, the work of installation to commence at once.

## Fernie, B.C.

The Kootenay Telephone Lines, Limited, Cranbrook, B.C., are installing a system to replace the one destroyed by the late fire. In the early spring the company will proceed with the construction of additional long distance lines throughout the East Kootenay district.

## Fort William, Ont.

Plans are being considered by the Board of Water, Light & Telephone Commissioners for general extensions to the municipal electric light plant, for which \$10,000 has been voted. Chas. J. Moors is Superintendent.

## Galt, Ont.

Representatives of Mr. John Patterson, the promoter of the Hamilton-Guelph electric road, were recently in this town purchasing the right-of-way for the new railway which it is proposed to construct this spring.

## Hamilton, Ont.

Mayor McLaren has received from Engineer Sotham answers to the questions submitted to him regarding the cost of Hydro-Electric power to Hamilton. Mr. Sotham says the commission will be able to furnish power to this city at \$17.52, or two cents per horse-power more than the original estimate, while this city's share of the cost of the transmission line, etc., will be only \$73,000, a much lower figure than was at first estimated.

The annual meeting of the shareholders of the Dominion Power & Transmission Company, which includes the Cataract Power Company and the various traction lines operated by it, was held recently at Hamilton, Ont. Mr. J. R. Moodie was re-elected president, James Dixon, vice-president, John Knox, treasurer, W. C. Hawkins, secretary and general manager. The other directors are: J. W. Sutherland, S. O. Greening, William Southam and Andrew Cook of Chicago. The shareholders ap-

proved of the agreement made for the improvement to the street railway system. According to the financial statement presented, the past year was a very satisfactory one. The net earnings of the transmission company amounted to \$249,193.35, of which \$125,000 went to pay interest on bonds, and \$124,193.35 was carried to profit and loss. The total profit and loss balance amounted to \$133,564.82, all of which was paid in dividends, except \$22,619.05, which was carried over. The total liabilities of the company amounted to \$14,958,280.18. Another statement shows that the earnings of the various companies were \$1,600,321.25, the operating expenses \$974,641.44, and the balance to the profit and loss \$302,623.49. The shareholders approved of the passing of the dividend to make needed improvements to the street railway system.

## Kamloops, B.C.

The council are considering the extension of the power plant.

H. K. Dutcher, of Cleveland, and A. Dutcher, Vancouver, B.C., have been engaged by the city to make a report on a scheme for reorganizing the municipal electric lighting and pumping plant.

## Kentville, N.S.

The Kentville Electric Light & Power Company will install another small generator in their lighting plant in the near future.

## Kingston, Ont.

The franchise of the Bell Telephone Company will expire on July 1st, and its renewal will be a matter for the City Council to consider. The franchise was granted in 1904, and the Telephone Company pays the city \$580 a year, and gives a certain number of free phones for the city buildings. The telephone system has increased greatly in Kingston during the past few years, and there are now about nine hundred phones in use. The company has not yet decided upon extending its underground system, which it began several years ago, but it will continue it before any permanent pavements are laid in the business section.

## Lethbridge, Alta.

Tenders were received until March 1st by Geo. Robinson, Secretary-Treasurer, for constructing a municipal power plant here, to include boilers, and accessories, economizer, feed pumps, mechanical draft, pipe work and valves, steam turbine generator, steam engine generator, re-erection of steam engines, condensing sets, crane, switchboards, etc., motor generators and transformers, building steel work, etc. Smith, Kerry & Chace, Confederation Life Building, Toronto, Ont., Engineers.

## Liverpool, N.S.

The Town Council are considering the addition of another generator to their lighting plant. Mr. A. H. Drew, Deputy Town Clerk, has charge of the electric plant.

## London, Ont.

Application is now being made for the incorporation of the London and North Western Railway Company for the construction of an electric line from this city to Sarnia, and from London to a point on Lake Huron, in the county of Huron.

## Morewood, Ont.

C. M. Willard states that the Morrisburg Electric Railway has plans under consider-



ation for beginning construction on its projected line this spring. The majority of the right of way has been secured. The road will be standard gage, 70 miles in length and will extend from Morrisburg to Ottawa, through the following cities:—Williamsburg, Winchester, Chesterville, Morewood, Orwan, Kenmore and Metcalf. The overhead trolley system will be installed on the line. The power plant and repair shops will be erected in Morrisburg. Headquarters, Box 45 Morewood. Capital stock, authorized, \$1,000,000; issued, \$200,000. Bonds, authorized, \$800,000. Officers: C. M. Willard, president and general manager; W. M. Louchridge, vice-president; Bradford Louchridge, secretary; J. H. Louchridge, treasurer, all of Morewood; Robert Merkley, Williamsburg, superintendent; G. Brown, Morrisburg, chief engineer.

#### MacLeod, Alta.

Tenders are now being asked for two new boilers and a 260 kw. direct-connected generator for the municipal electric light plant. G. H. Altham is superintendent.

#### Montreal, Que.

The Saraguay Electric & Water Company will construct about 2 miles of transmission lines this year. E. Champagne, Montreal, is manager.

The financial statement of the Shawinigan Water & Power Company, for 1908, shows a total gross earnings of \$706,224, and after providing for all charges and interest on bonds and debenture stock, a net surplus is shown of \$276,570, from which four quarterly dividends of one per cent. were paid for the year, and the sum of \$15,000 was added to the reserve fund. After transferring from reserve fund \$50,000, to cover sinking fund against consolidated mortgage bonds, the balance at credit of reserve fund is \$140,000. In addition there were charged off from contingent profits the amount of \$80,418 for depreciation of plant and other assets, the balance remaining to credit of contingent fund being \$36,503.

It is interesting to note the increase made by the Shawinigan Company in its gross earnings during the past three years. Gross income in 1906 amounted to \$357,147, in 1907, \$591,193, and in 1908, \$706,244. The increase in gross earnings over 1907 is thus \$125,000. A feature of the company's operation for the year is that operating and general expenses in proportion to gross revenue were lowered from twelve per cent. in 1907, to under eleven per cent. in 1908. During the year the company has increased its bonded debt by the issue of \$750,000 of 4½ per cent. debenture stock to cover capital expenditures. This debenture stock was satisfactorily disposed of on the London market.

A change in the directorate was announced owing to the retirement of Senator Robert Mackay, and the election of Sir M. Mitchell-Thomson, Bart., of London, to fill the vacancy. The directors elected were: President, J. E. Aldred; vice-president, Thos. McDougall; John Joyce, H. H. Melville, Sir M. Mitchell-Thomson, Bart., W. R. Warren, J. N. Greenshields, Wm. Mackenzie and Denis Murphy.

The Mexican Northern Power Company, Limited, consisting largely of Montreal and Toronto capitalists, have secured a franchise from the Government of the Republic for the utilization of the River Conchos, in the State of Chihuahua, and the site of the proposed power plant will be near Parral, one of the largest mining districts of the republic, comprising Parral, Minas Neuvas, Santa Barbara, San-

francisco del Oro, and other mines. The company will be in a position to supply light to the city of Chihuahua, a city of 75,000 people, besides many other smaller communities. The authorized capital stock of the company is \$10,000,000, the authorized bond issue being \$7,500,000, and applications for the bonds of the company exceeded the amount issued by over a million dollars. The securities of the company were offered in Eastern Canada by F. B. McCurdy & Company; in Western Canada by F. H. Deacon & Company, of Toronto, and in Montreal by F. B. McCurdy & Company, and the Canada Electric Syndicate, whose president is the Hon. B. F. Pearson, of Halifax. The directors of the company are Mr. G. F. Greenwood, C.E., late managing director of the Havana Electric Power Company, president; E. B. Greenshields, director of the Bank of Montreal, vice-president; Edmund Hanson, of the banking firm of Hanson Bros.; S. J. Moore, president of the Metropolitan Bank; J. D. Paterson, of Massey-Harris & Company, Toronto; S. M. Brookfield, president of the Eastern Canada Loan & Savings Company and president of the Halifax Dry Dock Company, and Hon. B. F. Pearson, M.L.A. Mr. Frank Thompson is secretary of the company, and Mr. W. F. Tye, late chief engineer of the C. P. R., is general manager and chief engineer. The president of the company, the chief engineer and several of the directors will leave for Mexico in the near future to make arrangements for carrying on the enterprise. The bankers for the company are the Royal Bank of Canada, and the trustees for the bondholders will be the Montreal Trust Deposit Company.

It is understood that two years and a half will be required to complete the construction work, but the chief engineer says that power in merchantable quantities can be sold in about eighteen months. A great deal of English, French and German capital is invested in the mines of the Paral district, and at present electric power produced by steam, costs from two to three hundred dollars (gold) per horse power. The new company will be able to supply it at the rate of \$100 per horse power. The Mexican Northern Power Company purpose developing up to about 35,000 horse power.

The Montreal Electric Light Company are proceeding with the erection of their distribution system in the city of Montreal and for immediate needs have closed a contract with the Saraguay Electric & Water Company for the supply of power in bulk. They expect to start construction work early in the spring on a 10,000 h.p. steam plant. This steam plant will ultimately be used as a reserve for their water powers when developed. Messrs. Wescott & Grier, of Montreal, Que., are the consulting engineers of the company.

#### Middleton, N.S.

The people of Middleton, in the Annapolis Valley, are considering the question of a lighting plant for the town. There is a small water fall of about twenty-five feet on the Annapolis river at Lawrencetown, about six miles below Middleton, from which they could develop about three hundred horse-power or more. They propose acquiring this, and building a power house, transmitting the power to Middleton. If Lawrencetown will fall in with the proposition, they can also secure their lighting from this source. At the present time, there are no electric lights in either of these towns. If the money can be raised for the purpose, it is planned to carry this proposition out in the near future.

#### New Westminster, B.C.

The rates for electric light at New Westminster, B. C., were recently discussed by the new city council and it was decided to make a number of reductions. The first clause of the new schedule makes the rate for the first thirty kilowatts 11 cents per kilowatt hour; the next thirty kilowatts 10 cents and the next forty or over 9 cents, these rates being based on meter measure. Clause two provides that hospitals, educational and charitable institutions be supplied with light at eight cents per kilowatt hour. Clause three deals with signs and window light for business houses, the rates to be determined from time to time, the minimum to be not less than fifty cents per month. Clause four provides that the corporation be charged \$36 per year for each arc light and five cents net for all other civic purposes, to be taken from the general revenue and added to the receipts of the electric light department. A change was made in the cost of light to the city from the regular rates to five cents per kilowatt net, which is slightly more than the cost of transmission and production. It is claimed that the new rates give New Westminster the lowest in Canada.

#### Ottawa, Ont.

The annual report of the Ottawa municipal electric system for 1908 shows that a satisfactory year's business has been done. The statement shows revenue for 1908 amounting to \$106,800.36 and a gross profit for the year of \$37,122.29. Deducting interest and sinking fund on \$330,000 bonds, leaves a net profit for the year of \$17,722.29, which has been carried to capital account. The capital account shows an expenditure for the year of \$26,079.65, which is provided for by the debenture for \$30,000 authorized by the Ontario Railway and Municipal Board. This account has now \$517.80 at its credit. The installation statement shows that the customers have increased in 1908 from 2,680 to 3,164, and the number of incandescent lamps installed from 50,715 to 61,040. The business statement shows that the percentage of cost of maintenance and operation (exclusive of power) to revenue was decreased last year from 43½ per cent, to 35¼ per cent.

According to a statement prepared for the annual meeting, Vancouver has the cheapest rate for street lighting in Canada, and Ottawa and Fort William come next. The rate for arc lamps for commercial use is lower in Ottawa than anywhere else. This is also the case with regard to incandescent lamps for commercial use. Niagara Falls has the cheapest meter rate for private lighting, and Fort William and St. Catharines are both a shade below Ottawa. With these exceptions Ottawa is the lowest for private lighting. Niagara Falls has the cheapest power. Port Arthur and Fort William charge the same as Ottawa.

The city has now been operating the plant for 3½ years. Comparing the business done by the city in 1908 with the last year of operation by the Consumers company, the following results are shown: The gross revenue was then \$35,207.41. It is now \$106,800.36, an increase of over 200 per cent. There was then no profit. There is now a net profit of \$17,722.29, after paying all interest and sinking fund. The number of customers was then 1,314. There are now 3,164, an increase of about 140 per cent. The number of incandescent lamps installed was then 28,160. There are now 61,040. There were then 30 miles of pole lines. There are now 80 miles, of which 40 are for street lighting. When



the plant was purchased there were a large number of streets along which the pole lines had but few customers. These lines consequently were not paying. Now the city has customers along all these streets, and its pole lines are fully loaded with the exception of those in one small district. Although the capital invested has been increased only about 60 per cent. (from \$200,000 to \$330,000), the revenue derived has been increased over 200 per cent. While the revenue has increased over 200 per cent., the expenditure for maintenance and operation has increased only about 110 per cent. The percentage of cost of maintenance of operation (exclusive of power) to revenue was 51 per cent. in the last year of operation by the Consumers company. It is now 35½ per cent. Before the Consumers company began to do business the rates were: 15 cents per kw. hour for light, \$40 and upwards per horse power for power, \$65 per arc lamp for lighting the streets. They are now: 7 1-5 cents per kw. hour for light, \$25 per horse power for power, \$45 per arc lamp for lighting the streets.

#### Port Colborne, Ont.

The Niagara Peninsula Railway Company will apply for permission to build a branch line of electric railway from this place through Welland, Ont.

#### Peterborough, Ont.

Announcement is made that the Peterborough Radial Railway Company contemplates extending its line from Clear Lake to a point in Stony Lake in Peterborough County. J. H. Larmouth is general manager.

W. Kennedy, jr., consulting engineer, Montreal, has submitted to the Water Commissioners plans for the proposed new dam and power house. The plans call for a pumping plant of one new unit of three million imperial gallons capacity per 24 hours when pumping against 115 pounds pressure in the air vessel, also the two 2 1-4 million gallons each pumping units in the present pump house. The new unit will be first installed and set to work, after which the old units will be repaired, if necessary, and removed to the new pumping station, thus providing an uninterrupted water supply to the town. The pumping capacity will then be 7 1-2 million gallons per day with provision in the pump house for an additional unit of 3 million imperial gallons per day, thus ultimately providing for 10 1-2 millions per day. The estimated cost of the dam, with bridge, power house, intake cribs, 7,500,000 gallons capacity pumping plant, installed complete, with suction and discharge pipes, is \$117,000.

#### Portage la Prairie, Man.

At a recent meeting of the City Council, Mr. E. A. McPherson on behalf of Carton, Addington & Miles, asked for a franchise for a power and lighting system. Aldermen Prout, Garland and Cooper were appointed a committee to investigate the proposition.

#### Port Hope, Ont.

Colonel Ward, K.C., of this town, will apply for the incorporation of the Cobourg, Port Hope & Havelock Electric Railway Company.

#### Port Arthur, Ont.

At a meeting of the Electric Railway Commissioners, the secretary was authorized to call for tenders for rails, ties, bolts, etc., required to complete the double tracking of the electric railway to the Fort William boundary.

#### Renfrew, Ont.

At a recent meeting of the Town Council, a by-law to raise \$85,000 for the purchase and development of the Hough water power was introduced and read a first time.

#### Sydney, C.B.

The East Bay Tramway Company are asking the Cape Breton County Council for financial assistance in the construction of a line of electric railway which they propose building from this city to East Bay.

#### St. Marys, Ont.

It is stated that final surveys of the North Midland Electric Railway are now being made and that the system will be in operation in a few months.

#### Swift Current, Sask.

A by-law granting a franchise to F. Laidley for the installation of an electric light and gas plant has received its second reading.

#### Sydney, N.S.

The Cape Breton County Council have agreed to grant a bonus of \$2,000 and exemption from taxation to the Dominion Railway & Plaster Company, which proposes to construct an electric tramway from Sydney to Plaster Quarries at East Bay.

#### St. Johns, Nfld.

R. W. Strong and E. W. Roberts, promoters of the Newfoundland General Electric Company, are soliciting signatures to a petition to the Newfoundland Legislature asking for a charter, under which a company is to be formed to light Bonavista, Catalina, King's Cove and Trinity by electricity—the power to be derived from Trinity Pond and Catalina Brook. Numerous signatures were obtained to the petitions, and the promoters are confident of success, if the requisite charter can be obtained. American capitalists are prepared to put up all the money necessary to carry on the work. In addition to electric lighting the company propose operating an electric trolley line between Catalina and Bonavista; the building of a marine slip, either at Catalina or Trinity, and the supplying of electric power to such local factories as the company may establish.

#### St. Thomas, Ont.

At the suggestion of the commissioners, the Southwestern Traction Company, of St. Thomas, recently made an offer for the lease of the city's street railway, which went behind financially last year about \$12,000. The company offered to take over the road, give a satisfactory service, and reduce the deficit about one-half, provided the city expends about \$12,000 to \$15,000 on improvements and continues to keep up the rolling stock and roadbed. This was not acceptable to the management, who believed with the proposed rearrangement of the tracks during the coming summer, that the deficit can be greatly reduced. The company is now considering another suggestion, that they take over and operate the local road without any remuneration, in consideration of their bonds for extending their suburban line from the city to Aylmer, being guaranteed. The company say no consideration will be given this last offer unless the legislature gives them the same powers as other suburban lines, and allows them to operate cars on Sunday.

#### Tweed, Ont.

The Tweed Electric Light & Power Company contemplate increasing the output of their plant and will install a 100 kw. 2 or 3 phase generator. J. T. Kissack is Secretary.

#### Tilbury, Ont.

The Tilbury Telephone Company, Limited, have obtained a franchise from the council for a period of twenty years.

#### Tranquille, B.C.

Mr. C. Deuteher, consulting engineer, Vancouver, has been engaged by the management of the sanatorium to report on the most efficient scheme for power supply at the institution.

#### Toronto, Ont.

It is expected that tenders for underground cable for the electric distributing plant will be called for shortly.

A deputation waited upon the Hon. Frank Cochrane recently to ask the Ontario Government to dam the head waters of the Mississippi river. The deputation consisted of B. Rosamond, ex-M.P. Metcalfe, A. Jamieson, W. H. Stafford and J. W. Wiley, of Almonte, Ont.; G. Moran and B. McHugh, of Arnprior, Ont.; J. B. Brown, Carleton Place, Ont., and T. B. Caldwell and A. C. Caldwell, of Lanark.

Mr. K. L. Aitken, the City Electrical Engineer, states that he is about ready to take tenders for the work on the municipal distributing plant. Plans have been prepared and surveys made.

A deputation from the Ottawa district waited upon the Hydro-Electric Commission to urge the erection of storage dams on the Mississippi river. It was pointed out that the generation of electrical energy by this means would be very cheap and beneficial to Carleton Place, Almonte, Blakeney, Pakenham, Appleby, and Galesburg, as well as to private industries. Consideration was promised.

The People's Railway Company have not yet awarded any contracts for the construction of the proposed overhead electric railway which is to connect Stratford, Berlin, Guelph and Woodstock, by way of Hamburg, Berlin, Fergus and Elora. The system will have about 18 miles of single track. It is the intention of the company to begin construction in April. Power will be purchased from the Hydro-Electric Company. The repair shops will probably be located at New Hamburg. The company has applied for a charter. Capital, \$1,000,000. Headquarters, 428 Traders' Bank Building, Toronto, Ont. Directors: N. R. Bugg, Bright, Ont.; W. A. Bugg, Joseph McNeil, A. N. Warfield and J. H. Wood, Toronto.

The Ontario Hydro-Electric Power Commission has awarded contracts for the electrical equipment of twelve stations on the transmission lines between Niagara Falls and Toronto, and Niagara Falls and St. Thomas. The contract was awarded to the Canadian General Electric Company, for about two-thirds of the total equipment, and the Canadian Westinghouse Company for about one-third. The apparatus includes a thorough modern protective system for the transmission lines, and a spare transformer for each station. Notwithstanding these important additions, the cost of the equipment will be \$350,000 less than estimated.

The City of Toronto's electrical department have been watching closely the price of copper, which has been hovering around fourteen cents, and have advised the Board of Control to buy \$20,000 worth of the metal. Copper prices fluctuate greatly, and as the city will require large quantities of copper for the civic light and power department, the policy of purchasing "on the soft spots" is to be followed. The Board of Control is taking steps to let



contracts for the necessary poles, ducts and mains for the city plant. No copper has yet been purchased, but as another decline in lake copper at New York is reported, to 13½ cents, it is probable that purchases will soon be made.

The Board of Control has decided to notify the Toronto Electric Light Company that it must not extend its system by erecting poles or stringing wires beyond the limits of the city as they existed at the time the franchise was granted. This means that the city will retain a monopoly of the lighting in the districts which have recently been annexed.

At the annual meeting of the shareholders of the Toronto Electric Light Company the directors for the year were elected as follows: Sir Henry Pellatt, W. D. Matthews, Hugh Blain, W. R. Brock, Hon. Geo. A. Cox, H. P. Dwight, S. F. McKinnon, Frederic Nicholls, Samuel Trees, Thomas Walmsley and L. Goldman. Mr. Goldman was the only new director. He took the place of the Hon. Robt. Jaffray, who resigned recently. The financial statement of the company for the past year ending December 31st, shows that the income for the year was \$1,155,582.61, and the expenses (including interest on debentures) were \$715,711.96, leaving a balance of profit of \$439,870.65, out of which were paid four quarterly dividends at the rate of 8 per cent. per annum, amounting to \$289,254.26, leaving a balance of \$150,616.39 to be carried forward to profit and loss, and bringing the amount at the credit of that account up to \$160,961.28. Of this amount the sum of \$150,000 has been transferred to the reserve account. Following is the financial statement:

Assets.	
Plant (including real estate) .....	\$5,364,522.26
Investments .....	229,412.00
General Supplies in stock ...	138,231.94
Accounts Receivable .....	138,338.66
Bills Receivable .....	7,783.58
Unexpired Insurance and Telephone Rentals .....	8,162.31
Cash on Deposit .....	145,105.24
Cash in Office .....	346.66
	<hr/>
	\$6,031,902.65
Liabilities.	
Capital Stock issued, \$4,000,000; paid up .....	\$3,798,100.73
Debentures Payable .....	1,000,000.00
Accounts Payable .....	153,993.33
Bills Payable .....	218,507.56
Mortgages Payable .....	23,000.00
Unclaimed Dividends .....	36.75
Accrued Interest on Debentures .....	22,500.00
Contingent Account .....	4,803.00
General Reserve .....	800,000.00
Profit and Loss Balance....	10,961.28
	<hr/>
	\$6,031,902.65

#### PROFIT AND LOSS ACCOUNT.

Dr.	
Operating Expenses, including Repairs .....	\$ 670,711.96
Interest on Debentures .....	45,000.00
Four Quarterly Dividends paid .....	289,254.26
Transferred to Reserve Account .....	150,000.00
Balance .....	10,961.28
	<hr/>
	\$1,165,927.50
Cr.	
Balance from Last Statement .....	\$ 10,344.89
Revenue from Lighting, Power, Rents, Sales, etc. ....	1,155,582.61
	<hr/>
	\$1,165,927.50

#### Vancouver, B.C.

Alfred Carmichael, hydraulic engineer and contractor, has been examining the water power at a site on the Powell river, where a large paper and pulp mill is to be erected by the Canadian Industrial Company. 5,000 h.p. will be developed at the outset.

#### Victoria, B.C.

The City Electrician in his annual report recommends the extension of the city's electric light plant by the addition of equipment having capacity for at least five hundred lights. He also recommends that a suitable building for store purposes be erected at the lighting station.

#### Woodstock, Ont.

Plans for the proposed radial railway from this city to Guelph, a distance of fifty miles, were recently outlined by Mr. W. A. Bugg, of the Woodstock-Guelph Railway Company. The estimated cost was placed at \$15,000 per mile.

#### Windsor, Ont.

George Bouteiller, Walkerville, Ont., is authority for the statement that the Windsor Tunnel & Lake Erie Company expects to begin construction about July on its proposed railway, which is to connect Windsor, Sandwich, West Vereker, New Canaan, McGregor, Huron and Oxley. From 26 to 30 miles of standard gage single track will be built. At the present time the company is at work securing franchises and will shortly apply for a charter. Officers: R. A. Bailey, Detroit, Mich., president; Dr. J. A. Smith, Windsor, vice-president; J. G. Leggatt, Laing Block, Windsor; Walter Boug, Windsor, treasurer.

#### Wingham, Ont.

A proposition is being made to form a rural telephone connection through the townships adjoining this town.

#### Winnipeg, Man.

Mr. Wm. Whyte, second vice-president of the C. P. R., when recently in this city stated that the company would shortly commence electrifying that portion of the system in southern British Columbia and eventually all of its lines in the west.

Tenders for electric wiring and fittings for the new examining warehouse will be received until March 2nd by N. Tessier, Secretary, Department of Public Works, Ottawa.

Bids will be received at the office of the Chairman, Board of Control, until March 2 for supply and delivery of insulators, telephone line, transmission line and repair shop equipment in connection with the proposed Point du Bois hydro-electric development. Engineers, Smith, Kerry & Chace, Confederation Life Building, Toronto, Ont. M. Peterson, Secretary, Board of Control.

The City Council have passed a by-law to provide for an issue of half a million pounds sterling in bonds on the London market, the money to be used for local improvements and municipal power plant.

The C. P. R. announce that the telephone system will be installed almost immediately between this city and Brandon, to supersede the telegraph for train despatching. If the experiment proves successful extensions are contemplated.

#### AWARDED.

#### McLeod, Alta.

The Northern Electric & Manufacturing Company, Limited, have been awarded the contract for a Western electric 260 kw. 2,200 volt, 60 cycle polyphase alternator and switchboard for the town.

## For Sale

One Warren Generator, 150 K. W. single phase, 133 cycles, 2200 volts, 800 speed, complete with Exciter and Switchboard; only in use one year. For further information apply to

S. T. KELLY, City Electrician, Strathcona, Alberta.

## Electric Lighting

The Town of North Battleford, Saskatchewan, the Chief Divisional Point on the Main Line of the Canadian Northern Railway is open to grant a franchise for electric lighting.

Address  
J. A. GREGORY,  
Mayor

## Business for Sale

An electrical contracting business in good Ontario city is offered for sale. Good local connection. Owner has another proposition in view. Address Box 105, ELECTRICAL NEWS, Toronto.

## Wanted

The undersigned invites applications for a position of responsibility with an electric railway company in Western Canada. Applicants must have a thorough knowledge of all branches of interurban and street railway operation, including tariffs and despatching. Give age, experience and particulars as to position now held; also state salary expected.

COL. A. T. THOMPSON,  
Trust Bldg., Spark St., Ottawa, Canada.

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THOS. C. IRVING,  
Gen. Man. Western Canada, Toronto

### Death of Mr. John Starr of Halifax

Mr. John Starr, the well known senior member of the electrical engineering and contracting firm of John Starr, Son & Company, Limited, Halifax, died recently at Halifax. Mr. Starr was one of the best known business men in Nova Scotia. His early life was spent in the hardware trade, and he and his brother David carried on business in that line for many years, but as electricity came into general use electrical supplies were largely handled by the firm, and in 1883 the firm of John Starr, Son & Company, electrical contractors, was founded by Mr. Starr. It is now the oldest established electrical supply house in Canada. The business expanded and some years ago became John Starr, Son & Company, Limited. Mr. John Starr introduced the American system of arc lighting in Halifax, Charlottetown, Moncton, St. John's, Nfld., and other places. He spent two or three years in London, Paris and Marseilles, where he also introduced the street electric lighting system. Mr. Starr was in his 81st year. He leaves two sons, C. C. Starr, associated in the business, and David Starr, manager of the Electric Power Company in Glasgow, and four daughters.

D. VanNostrand Company, New York, have published a seventh edition of the comprehensive book upon "Alternating Current Machines," written by Samuel Sheldon, A.M., Ph.D., D.Sc.; Hobart Mason, B.S., E.E., and Erich Hausmann, B.S., E.E. The book has been completely rewritten and is intended as a text book for technical educational institutions. It is thoroughly practical and is arranged in a manner which makes its information easily acquired. It is profusely illustrated

and the subjects are dealt with in an exhaustive and interesting manner.

### MOONLIGHT SCHEDULE FOR MARCH.

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Mar. 1	1 50	Mar. 1	5 40	3 50
2	2 40	2	5 40	3 00
3	3 30	3	5 40	2 10
4	No Light	4	No Light	
5	" "	5	" "	
6	" "	6	" "	
7	" "	7	" "	
8	6 30	8	9 00	2 30
9	6 30	9	10 00	3 30
10	6 30	10	11 00	4 30
11	6 30	12	0 00	5 30
12	6 30	13	1 00	6 30
13	6 30	14	2 00	7 30
14	6 30	15	3 10	8 40
15	6 30	16	4 10	9 40
16	6 30	17	5 10	10 40
17	6 40	18	5 20	10 40
18	6 40	19	5 20	10 40
19	6 40	20	5 20	10 40
20	6 40	21	5 20	10 40
21	6 40	22	5 20	10 40
22	6 40	23	5 20	10 40
23	6 40	24	5 20	10 40
24	6 40	25	5 10	10 30
25	6 40	26	5 10	10 30
26	10 10	27	5 10	6 30
27	11 40	28	5 10	5 30
29	0 40	29	5 10	4 30
30	1 30	30	5 10	3 40
31	2 10	31	5 00	2 50

Total .....186 40

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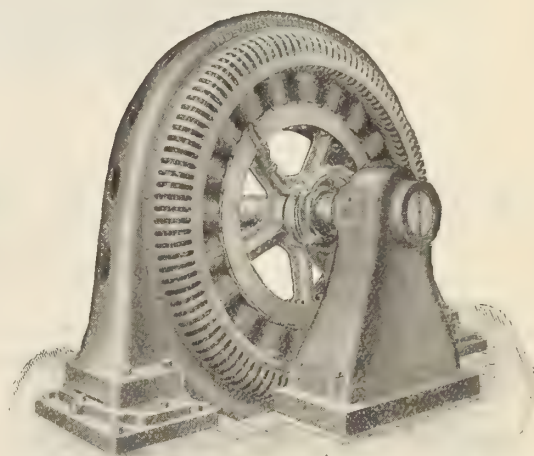
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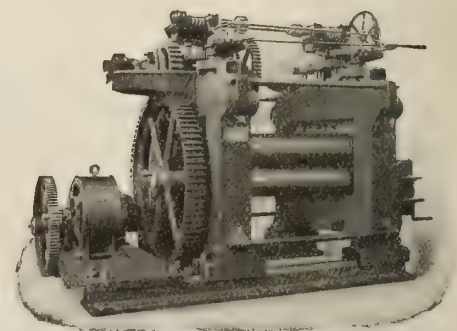
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**A Westinghouse Motor direct connected to a Machine has Many Advantages**

The advantages are both direct and indirect and result in greater economy, reduced labor and increased output. This means a decrease in the cost of the product per unit of output, and at the same time an increase in the revenues from the investment in costly machines and tools



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Room 12 x 14 feet, beautifully illuminated with a one-unit fixture containing one 60 watt Tungsten Lamp—consuming current about equal to one 16 c.p. carbon filament lamp.

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### The Long Looked for Comfortable Method

THIS SYSTEM is one of the greatest modern advancements marking an epoch in interior illumination. It is within the reach of the person of ordinary means and is no experiment. In use in residences, offices, halls and auditoriums. Has been endorsed and recommended by leading oculists and medical authorities. Many of the headaches and disarrangements of the nervous system are caused by the barbarous method of having the brilliant modern lights in line of vision.

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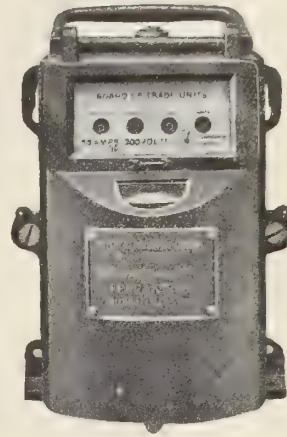
THE LIGHT is reflected without loss to the ceiling and evenly distributed throughout the room. Those who have them in use would go back to the old method only under protest. Complete fixtures furnished or inexpensive units that can be easily applied to fixtures now in use. We will furnish on application full information, and reference to residences, clubs and offices where this system is now being successfully used.

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We are licensed by and utilize the National X-Ray Reflector Company's Special Pure Silver Plated Reflector in these units

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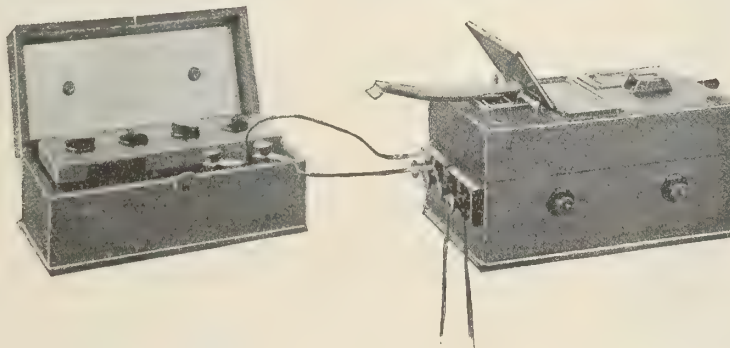
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500 and 250 Volts Constant Pressure Generator.  
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All Capacities  
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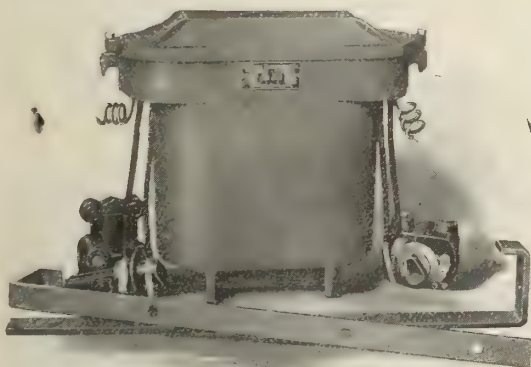
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are Guaranteed to Exceed their Specification

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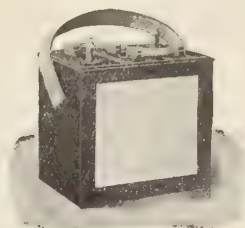


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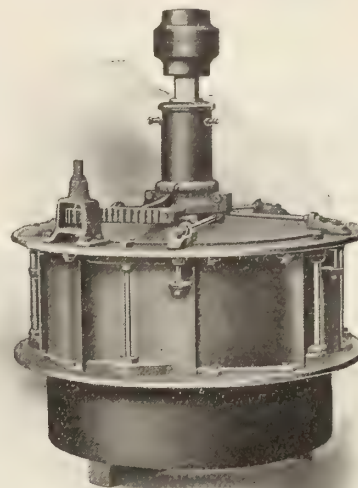
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**Electrical Contracts Awarded****Chemainus, B.C.**

Hinton & Company, Victoria, B.C., have  
been awarded the contract for the instal-  
lation of a new electric plant at the Pal-  
mer mills. This company have recently  
completed contracts for a fire alarm sys-  
tem and a lighting plant at Vernon, B.C.

**Campbellford, Ont.**

The Ontario Securities Company have  
been awarded \$50,000 bonds of this town,  
issued for the completion of the hydro-  
electric plant.

**Dryden, Ont.**

The Gordon Pulp & Paper Company have  
closed a contract with the Stebbins Engi-  
neering & Manufacturing Company, of Wat-  
ertown, N.J., for the entire equipment of  
machinery and apparatus required for their  
40-ton sulphite plant now in course of con-  
struction. The company has at this point  
on the Wabigoon river a good water power  
and mill site, where 5,000 horse-power will  
be developed under a head of 46 feet.  
Samuel Nesbitt, Brighton, Ont., is presi-  
dent of the Gordon Pulp & Paper Com-  
pany, and Chas. B. Gordon secretary and  
general manager.

**Edmonton, Alta.**

The contract for an 1,800 horse power  
steam engine at a cost of \$27,800 f. o. b.  
Edmonton, has been awarded to Goldie &  
McCulloch, Galt, Ont. The new engine is  
designed to operate a 1,000 kilowatt alter-  
nator which was purchased from the Can-  
adian General Electric Company for \$14-  
300. Tenders were submitted for both gas  
engines and steam engines, but acting  
upon Commissioner McNaughton's report  
the Council unanimously decided in favor  
of the steam plant. According to the  
Commissioner's report the cost of a steam  
plant, together with all auxiliaries, would  
be \$74,350, while a gas producer plant of  
the same capacity would cost over twice

Tenders were recently opened for the  
new machinery required for the power  
house extension. Following are the bids  
on two 400 kw. generators: Canadian Gen-  
eral Electric, weight, two machines, 45,000  
pounds, \$8,500; Northern Electric Com-  
pany, 50,000 pounds, \$9,250; Allis-Cham-  
bers-Bullock, 57,000 pounds, \$10,250;  
Canadian Westinghouse Company, 56,000  
pounds, \$9,800; Crocker-Wheeler Company,  
42,000 pounds, \$7,100. All of these ma-  
chines were quoted f.o.b. Edmonton, freight  
and duty paid, except the Westinghouse,  
which was f.o.b. Hamilton. The Crocker  
Wheeler tender was accepted.

**Winnipeg, Man.**

The tender of G. A. Powell, Winnipeg,  
has been accepted for supplying 8,000 lbs.  
of copper and six miles of iron wire for  
fire alarms and street railway lighting ex-  
tension, the copper wire at \$17.85 per 100  
pounds, and the iron wire at \$41.45 per  
mile.

The Winnipeg Electric Railway Com-  
pany have awarded to J. A. Dawson, of  
Montreal, a contract for 30 Brill steel  
trucks for new cars now in course of con-  
struction.

The seventeenth annual report of the  
Toronto Railway Company states that the  
gross receipts were \$3,566,493.72, and the  
maintenance and operating expenses \$1-  
889,046.62, making the per cent. of the  
operating expenses to gross earnings 52.9  
or 1 per cent. less than last year. The net  
earnings were \$1,721,276.36 as against \$1-  
617,961.45 in 1907.

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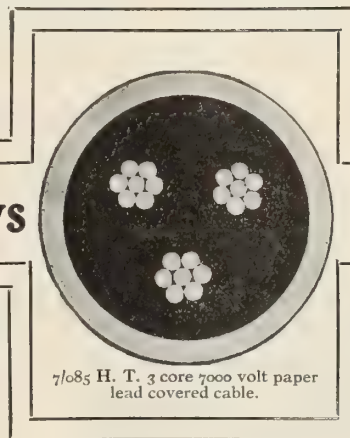
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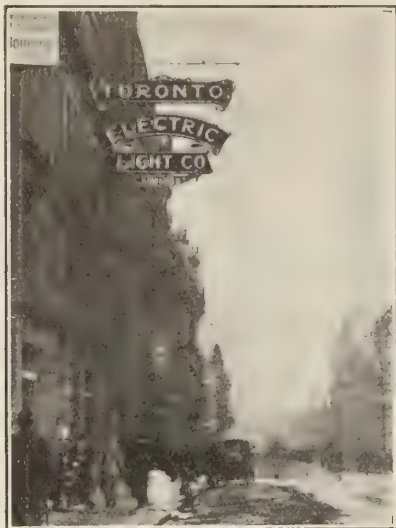
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Our type "A" electric letters are the VERY LATEST AND BEST IN THE ART. Type "A" signs on an average

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Yet the signs have BLAZING COMPELLING BRILLIANCY. They are VERY LEGIBLE and BEAUTIFUL day or night. They bring you SATISFIED CUSTOMERS.

We only ask a chance to prove our claims. Write us for full particulars. TYPE "A" letter signs can now be furnished in all sizes of letters from 6 to 24 inches inclusive.

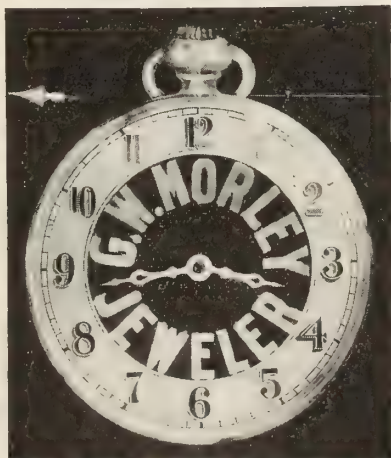
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Only one business man in a hundred can afford a Grooved Letter Electric Sign, but every store keeper, large and small, in your town or city can afford to use our new One Light Signs on account of their economy.

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## The A & W One Light Electric Signs

to one of the ordinary grooved type.

By increasing the number of signs in use and decreasing the cost to the consumer you will make money, and have fifty or more pleased customers, where you now have none. Another point to be considered:—A & W One Light Signs are used on an average 10 hours every night in the week.

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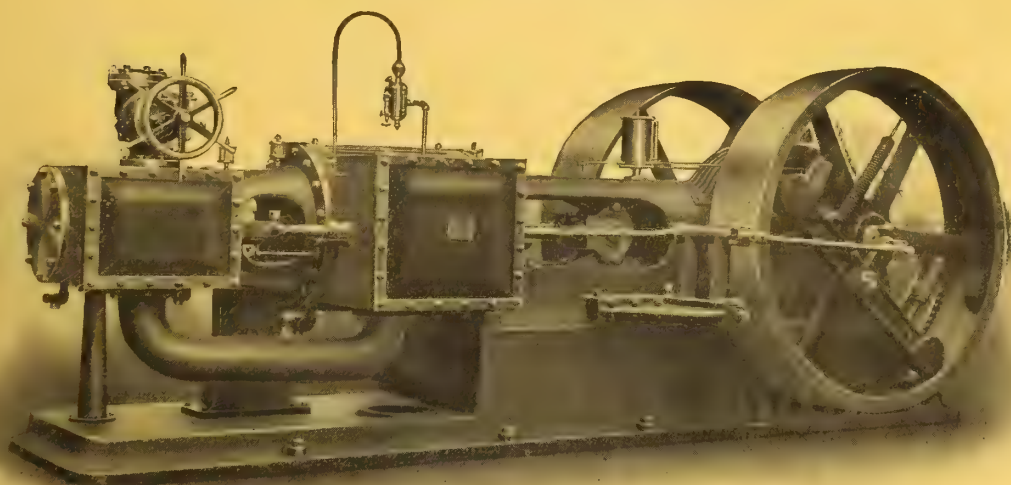
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is a Graduate of Hard Knocks College

THE main idea of using exhaust steam to heat feed water may be simple enough, but there are lots of little points in the design of the Cochrane Open Feed Water Heater that it has required some hard knocks in the world of experience to work out. This is one good reason why you should investigate Cochrane rather than experiment with other heaters. Its cheaper.

The other day we met the Chief Engineer of a large paper company which recently put in another make of heater, and we asked him how he liked it. "Oh," he replied, "as a tank it is all right, but we have had to take out all the insides. The depositing pans, or surfaces, soon scaled up, and when we tried to clean them they became so bent and twisted that it was impossible to put them back." The main reason for this trouble was that the pans were made of sheet metal, instead of thick cast iron as is used in the Cochrane Heater.

This is one thing, but there are a dozen others equally or more important, such as the Oil Separator, the Cold Water Regulator, the Filter, the Overflow, the Pump Supply, the Cleaning Doors, the Presence or Absence of Troublesome Internal Compartments, and even down to the Thermometer. We always put a thermometer in the pump supply pipe. Most makers do not. Perhaps there is a reason.

Write for our Treatise on Heaters, or if you have a case in hand, give us full particulars and we will be pleased to prepare a lay-out and estimate.

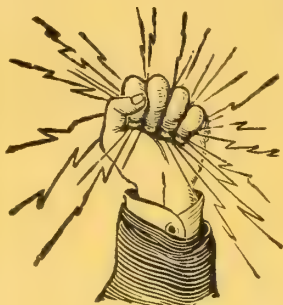
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### N. E. Code Standard Porcelain Bases

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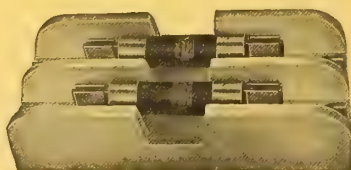


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A complete new series supplementing  
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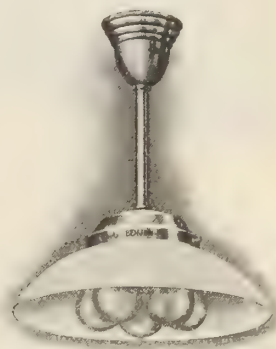
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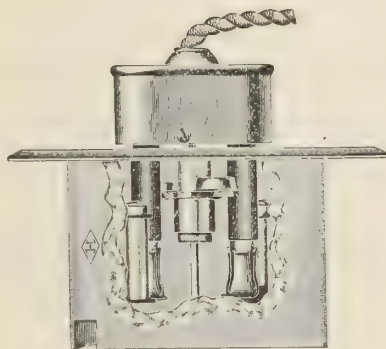
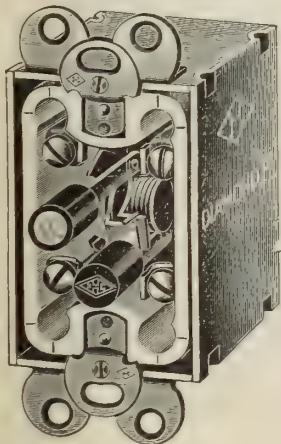
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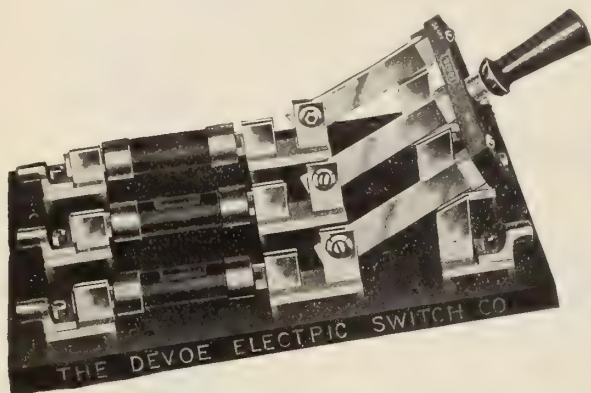
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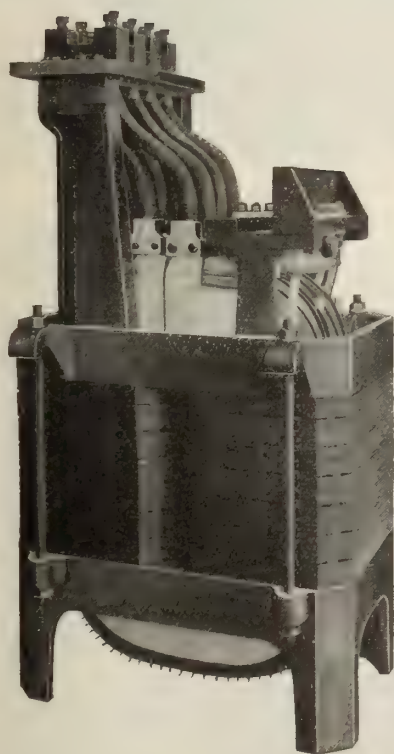
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maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

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Special Transformers for  
Electric Reduction and  
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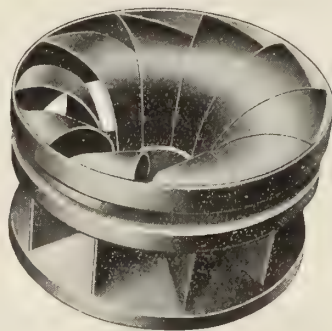
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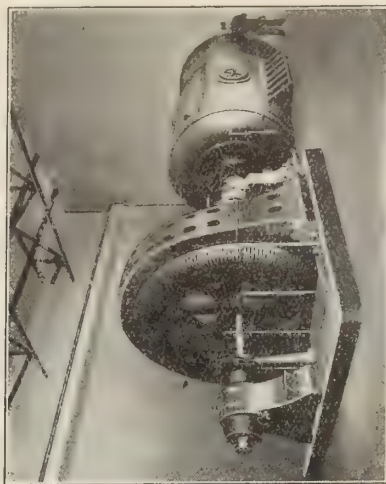
# HYDRO ELECTRIC PLANTS



**425 K. W. WATER WHEEL TYPE  
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Bulletin 1050.



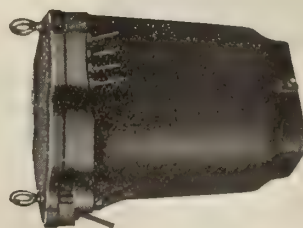
**WATER WHEELS**  
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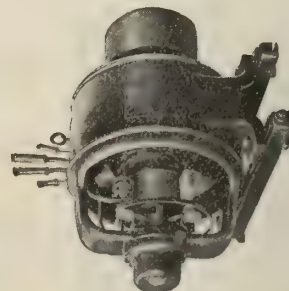
**1500 K. W. WATER WHEEL TYPE  
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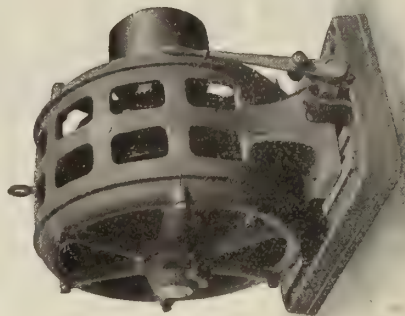
The Ball = Mark



**TRANSFORMERS**  
Lighting Bulletin 300.  
Power " 1047.

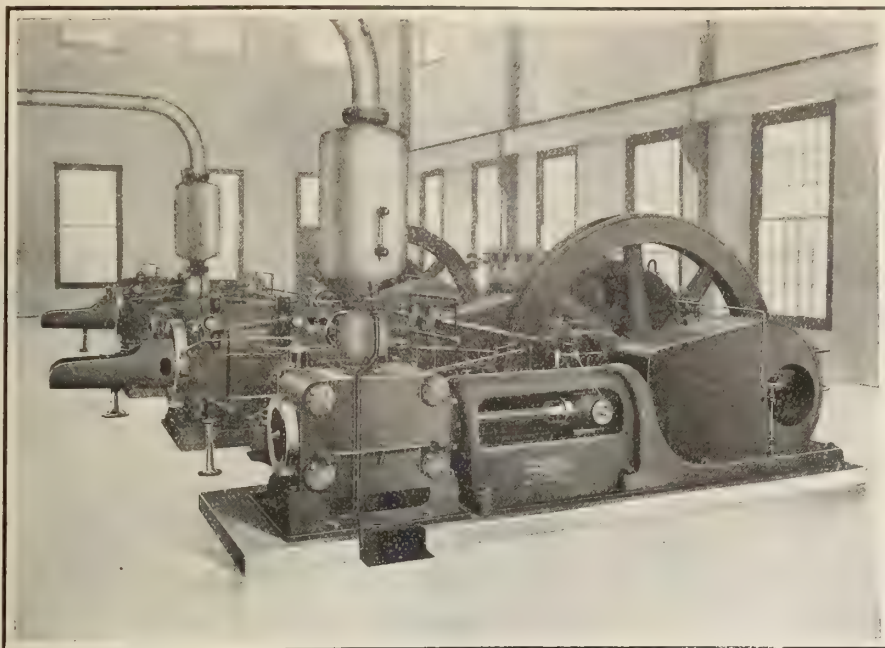


**DIRECT CURRENT  
EXCITERS**  
Bulletin 1057.



**INDUCTION MOTORS**  
Bulletin 301.





# Goldie Corliss Engines

Illustration shows the  
Power House of the  
**new Grand Trunk  
shops at Stratford,  
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two GOLDIE  
CORLISS ENGINES.**

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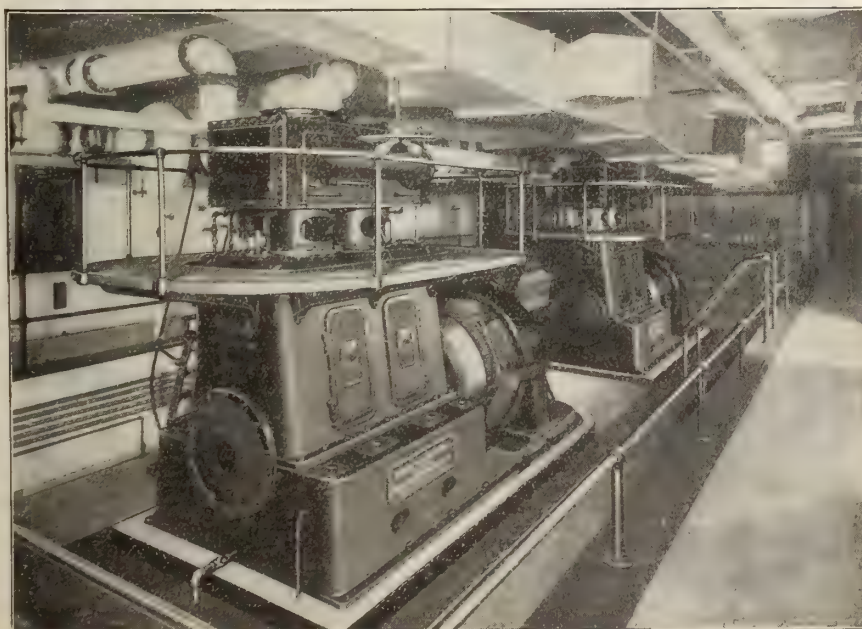
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of the English enclosed  
type with pressure oil-  
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They may be used in any position and in any ordinary lamp socket.

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Equal life on A. C. or D. C. Circuits.

Supreme in Brilliancy and Efficiency.

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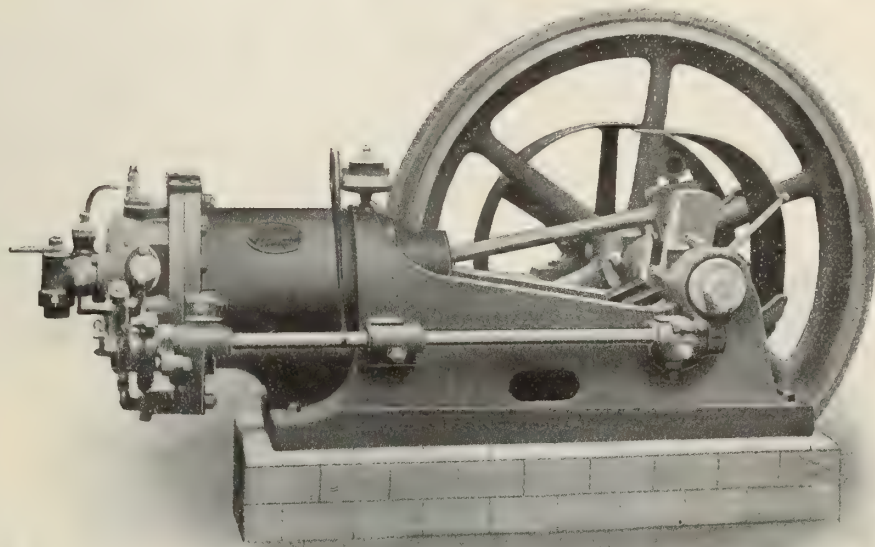
Halifax

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Rossland



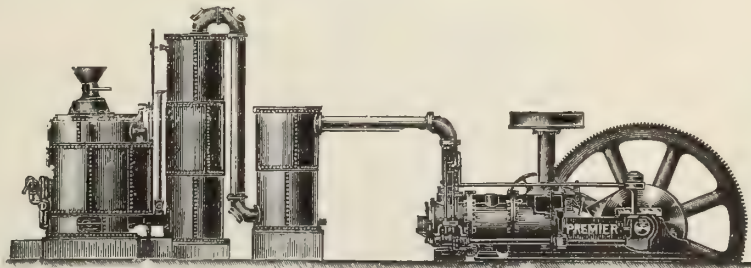
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# Low Core Losses

have always been a distinguishing feature of

## Moloney Transformers

but now, having made thorough tests of the non-ageing qualities of SILICON STEEL under long-continued high temperature, we are prepared to furnish MOLONEY TRANSFORMERS with cores of the new alloy.

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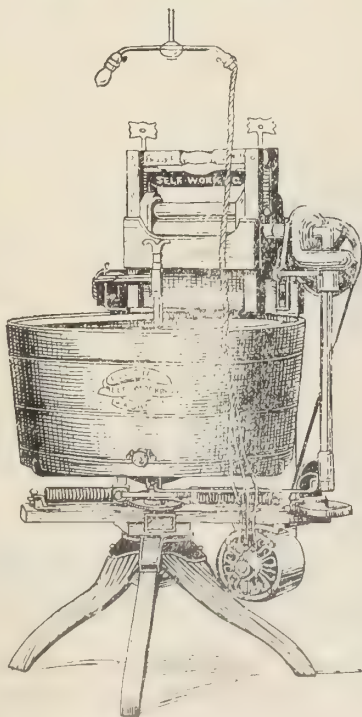
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Winnipeg

Please your customers by permitting us to loan them

# A 1900 Washer and Wringer

## Thirty Days Free



Our plan is to **co-operate** with electric light companies in putting out the "1900" Electric Motor Washer and Wringer. Our interests and those of the Central Station are **identical**. We want to sell washing machines; you want to sell current. As it takes **electricity** to **operate** our washers, every one sold in your community **increases** the sale of current.

Then there is another side to the "1900" proposition: **Every** one of our machines sold in your city helps **popularize** the use of electricity. Every one is a **permanent advertisement** for electricity in the home. This is **not** a theory but the **actual experience** of Central Stations that handle our machines. They find that every "1900" Washer they sell gets them from **one to three new residence customers a year**.

The motor operates both the washer and the wringer, thus using a fair amount of current.

**WRITE US TO-DAY** for full particulars about our plans to put out our "1900" Washer in your city.

The  
**"1900" Washer Company**  
 357 Yonge St., Toronto, Can.



# Monarch Electric Co., Limited

579 St. Paul Street, MONTREAL

Switchboards

Oil Switches

2,000 Volt  
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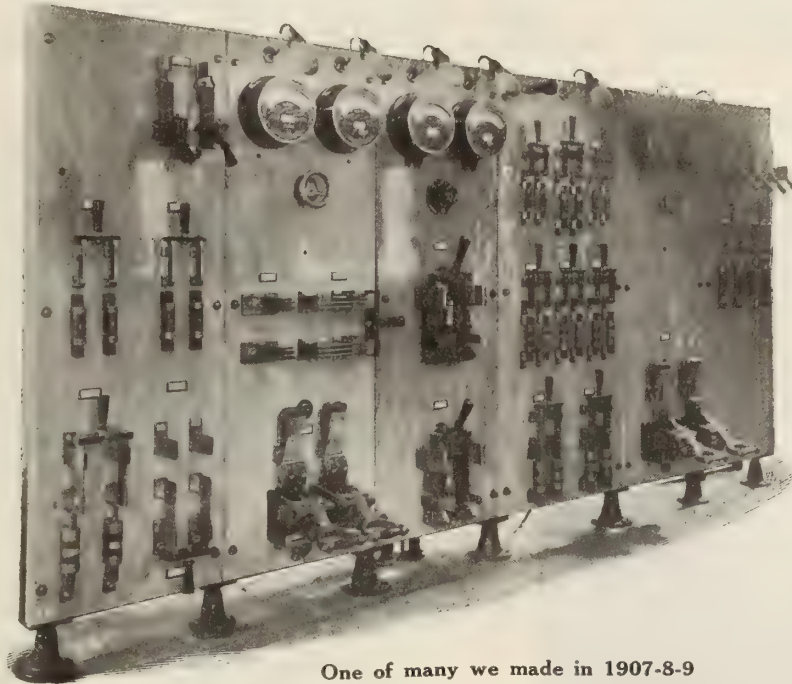
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Commutators

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Special  
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Special Machinery  
designed or built to  
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Metal  
Novelties

We solicit an op-  
portunity to quote  
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## A Unique Instrument for the Measurement of Direct Current

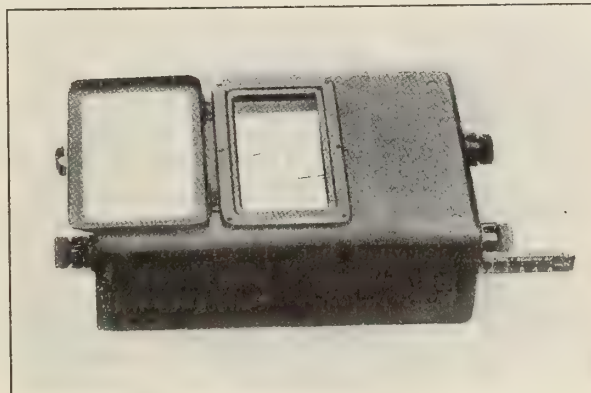
### Range

.001 to 1000 amperes

.001 to 1000 volts

1 milliwatt to 1 million watts

1 milliohm to 1 million ohms



Accuracy guaranteed  
within its range.

Instrument is fitted  
with external zero ad-  
justment.

"Navy" Type Combined Ammeter and Voltmeter.

Every battleship, cruiser, torpedo boat and destroyer of the British Navy has one of these handy instruments in its equipment.

## J. F. B. Vandeleur, Dineen Building, Toronto

Sole Canadian Agent for EVERSHED & VIGNOLES, London, England

## Personal Mention

Mr. J. F. B. Vandeleur has returned from England. He brings with him some equipments of air compressors which we understand are to be installed for local contracts. Mr. Vandeleur while away has been investigating new developments in the manufacture of electrical measuring instruments and will be able to advise the electrical fraternity as to the latest practice in the use of such apparatus in the largest power generating stations on the Continent.



The late John Starr

The accompanying picture of the late Mr. John Starr, of Halifax, a reference to whose death last month was made in the March "Electrical News," will recall to many members of the electrical profession a man who during his lifetime was a noted figure in his profession. He was a pioneer in Canadian street lighting and introduced the American arc system to many eastern Canadian cities and was connected with many engineering ventures.

### Mr. G. A. McCarthy Joins Well-Known Firm

G. A. McCarthy, Esq., who has just resigned his position as chief engineer of the Temiskaming & Northern Ontario Railway, is well known throughout the engineering profession in Eastern Canada, having occupied several positions of great professional responsibility, and the carrying out of the works which he has undertaken to construct for Messrs. Smith, Kerry & Chace in the neighborhood of Cobalt will afford him an opportunity to exercise his well recognized professional ability. It is understood that Mr. McCarthy will be in complete charge of the construction of the works for the new power company, which has been organized by Messrs. Smith, Kerry & Chace, and which will furnish about 10,000 horse-power to the mines of Cobalt and the Cobalt district.

Mr. McCarthy was born in New Brunswick, and received his engineering training as a member of the staff

of the Intercolonial Railway, with headquarters at Moncton, N.B. After seven years' service on this well known line, Mr. McCarthy decided to give himself the advantage of a thorough training in the technique of his profession, and resigned his position to become a student in the civil engineering course at McGill University. Four years later, in 1898, he completed his university training, graduating with distinction, and with university honors in many subjects.

Immediately after graduating, Mr. McCarthy joined the maintenance-of-way staff of the Canadian Pacific Railway, and worked on the Lake Superior division of that road during 1898 and 1899, and in 1900 he was appointed engineer and acting manager for The Port Hood Coal Company, of Cape Breton. Mr. McCarthy left this last position to become assistant engineer of the Algoma Central Railway.

In 1901, Mr. C. B. Smith, who, as member of the teaching staff of McGill University, had had a good opportunity to measure Mr. McCarthy's ability, accepted the position of engineer in charge of the construction of the works of the Canadian Niagara Power Company, at Niagara Falls, Ontario, this being the first of the great developments to be undertaken at Niagara Falls on the Canadian side. Mr. McCarthy accepted the position of principal assistant under Mr. Smith, and remained connected with the Canadian Niagara Power Company throughout the construction of its well known station, this work occupying his attention in all for nearly four years.

In the spring of 1905, Mr. McCarthy joined the staff of the Temiskaming & Northern Ontario Railway, and was promoted to the position of chief engineer of that work in May of the same year. The construction of this railway to the junction with the National Transcontinental Railway at Cochrane, Ontario, being now practically completed, and there being little more than maintenance-of-way work to be undertaken on the line in the immediate future, Mr. McCarthy has considered it wise to connect himself with new work that will be actively prosecuted, and therefore accepted the position above mentioned, for which his intimate knowledge of the growth of Cobalt industries, and of the facilities which are necessary to their most successful development, makes him singularly adapted. Mr. McCarthy has already entered on the work of his new position and has, at present, a considerable staff of engineers at work on preliminary surveys.

### Plans of the Hydro-Electric Commission

Arrangements are now being made for the enlargement of the staff of the commission, which will look after the work. The commission, of course, will be the head, with the chief engineer. About forty engineers and their assistants will be appointed, and the work will be divided into the four branches of accounting, operating, construction and engineering. Engineers will be in charge of the transmission line construction, transformer stations construction, right-of-way and design. There will also be shop inspectors, foremen and assistants.

Dundas will be the operating station, and the power will be sent to the various lines from there. It will also be the transforming station for Hamilton and Dundas. This will be the most important station on the line.

The offices occupied by the commission in the Continental Life Building, Toronto, have been enlarged to accommodate the increased staff, and will be occupied until more commodious quarters are provided in the new addition which will be built to the Parliament Buildings.



# SUNBEAM LAMPS

**ARE MADE BY LAMP MAKERS**

**We don't make anything else**

**It's good to know our line of  
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**The Label is the guarantee of  
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MANUFACTURED BY

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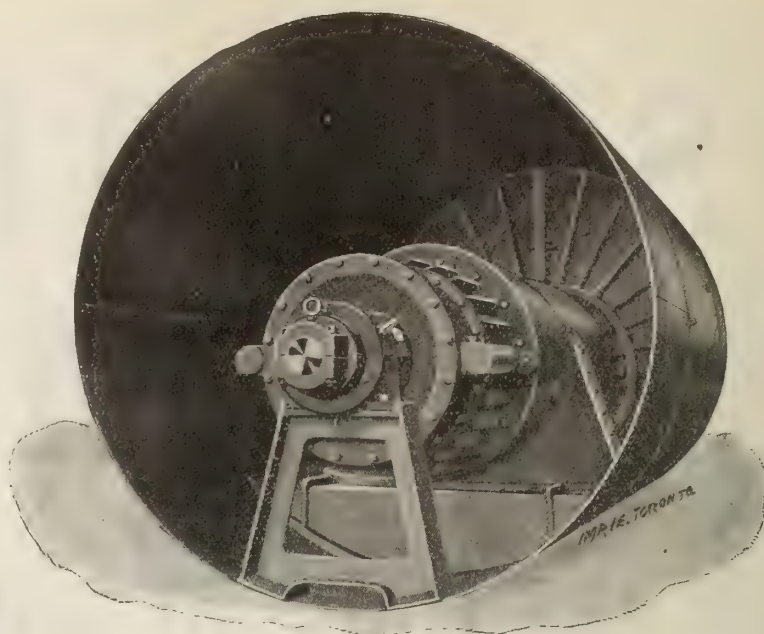
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If interested in Water Power development let us tell you about our Improved Turbine.

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After studying the conditions we design each installation to give the maximum of power and efficiency.

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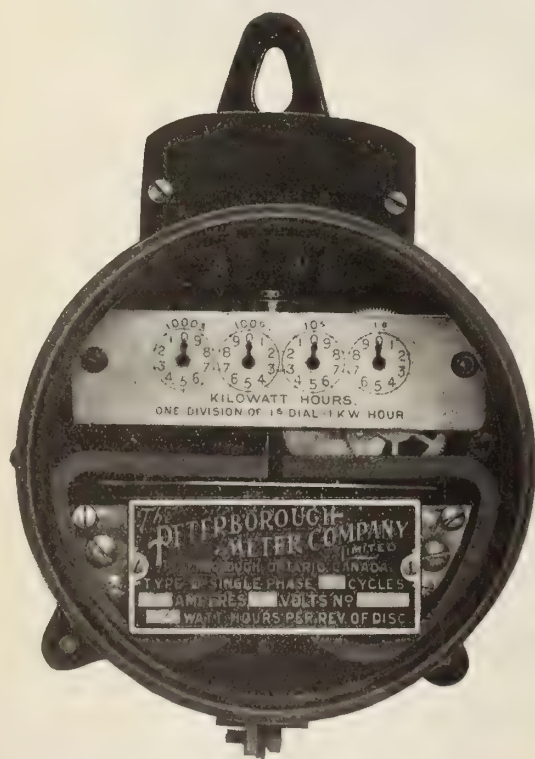
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Works: Sherbrooke, Que. St. Catharines, Ont.



Can Ship Immediately

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload. Will run continuously and accurately on fifty per cent. overload.

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# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired without cost to the advertiser.

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### EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## The 1909 Convention

As was noted in last month's "Electrical News," the time for this year's C.E.A. convention is rapidly drawing near. In view of this it behooves everybody interested in electrical matters to see what arrangement can be made for him to go to that convention, and, in the language of the keep-out sign on the gate, "This means you." The officials of the C.E.A. have all been doing their level best to make the association of the greatest possible value to the electrical industry, and to this end selected Quebec for this year's meeting, feeling that the eastern members were entitled to the encouragement which the holding of a convention right in their midst will undoubtedly give them. Naturally the choice of Quebec will be somewhat against the wishes of some members, more particularly those from the western end of Ontario, because of the extra time and money necessary to reach it. This objection is, of course, well founded, but at the same time it must be remembered that the membership of the association extends all over Canada, and that it is conducive to the best interests

of every member that the convention should move round as much as is reasonably possible.

This question of money brings up a point that perhaps may properly be taken up in these columns, which is as follows: The C.E.A. is an association which can, and does, result in much good to all operating men who take an energetic interest in the annual convention. This being the case, is it not the very plain duty of all operating companies to see that the proper officials on their various staffs are members of the association, that they be encouraged to go to the convention and take an active part therein, and that their membership fees and other expenses be paid by the company? We are much afraid that this is not customary with many of our companies, though it is but eminently proper that it should be. In fact, self-interest alone should be sufficient justification for such a course, exclusive of the many other excellent reasons to be urged in its favor, because the information to be gathered at such conventions, and, in fact, obtainable nowhere else, is of the greatest possible value to every operating company, in that the ideas a man gathers there are invariably used for the good of his plant as soon as he reaches home.

The programme for the 1909 convention will undoubtedly be just a little better than 1908, and that was very good. We expect to be able to say more about it, and the various other convention arrangements, in our next issue. In the meantime, Mr. Owner, and Mr. Fire and Light Commissioners, see if you cannot arrange for your electrician or engineer to go to this year's convention, and that, not at his own expense. We assure you that it will be one of the best investments you ever made.

## What's the Matter with Canadians?

Why is it in Canada that no Canadians need apply? Perhaps you do not think that this state of affairs exists, but if you will take the trouble to investigate a little, you will without doubt come to the conclusion that conditions in this respect are in anything but a satisfactory state. When it is recalled that the erection of the Quebec bridge was very largely in the hands of engineers foreign to this country, a good reason is obtained for saying that foreigners have had their turn, and that it is now time to try the home product.

In addition to this injustice on the part of the Dominion authorities, the Ontario Government have more or less to answer for in connection with the Hydro-Electric operations. The City of Toronto and the City of Hamilton have both thought it necessary to go outside the country for technical advice, and, if newspaper reports be true, two of our largest operating companies have been unable to find in all of our broad Dominion the men to fill very fair positions which were lately vacant on their staffs. Surely these things should not be, and for a number of excellent reasons. To begin with, practically all the appointments, if not absolutely all, are connected with bodies or undertakings which make their incomes from Canadians and Canadian en-



terprise and industry. It is but a small return, and one most justly due, that Canadians should form their various staffs. Then, again, as with the body physical so with the body national, a faculty neglected will surely become a faculty entirely lost, and our younger men, seeing nothing ahead of them but the creation of good things for foreign competition, will gradually drift off to other countries, or at least to other pursuits; a distinct loss, not only to the engineering profession in Canada, but to the country at large. Lastly, are those who go outside their own country for their trained men getting better value for their money than they can get at home, which would, of course, explain why they do it? We know they are not, for examples to the contrary are notorious. Why then does such a state of affairs continue?

### The Meter System Maintenance and Rentals

The question is often asked, especially by flat rate lighting plants which are carrying a load just about equal to their capacity, as to the effect on their plant if meters were introduced. It is, of course, impossible to give a very specific answer to such a broad question, but in general terms it may be replied to as follows: First of all, the bills for the first one or two months will be fairly heavy, much greater than the consumer expects, and consequently there will be a great many irate customers. The majority of them, however, can generally be pacified by reminding them that they can scarcely expect their households to make the great jump in one moment from the use of unlimited light, night or day, needed or not needed, to light only when and where reasonably necessary. Consequently they must expect the first one or two bills to be materially higher than they will be afterwards. This explanation, which is just as true as it is simple, will satisfy the great majority of objectors, though it is quite within the probabilities that a few customers will withdraw their patronage on the ground that the meter system is but another name for a raise in rates. To balance this not very pleasant result the station manager will find several compensations, and perhaps the most noticeable of these will be the great reduction in his load, particularly that carried all night. But that does not mean a corresponding reduction in his earnings, because his current is now being sold on a different basis, the average experience being that the gross income remains the same, or approximately so, notwithstanding a thirty to fifty per cent. reduction in the peak load. This being the case, the net income is bound to rise materially, due to the lower fuel consumption rendered possible by the reduction in load.

The foregoing, of course, applies to only such plants as have to reckon with the cost of power, so that the results detailed do not hold where power may in one sense be said to cost nothing, as in the water power station, or where generators are run from blast furnace gases, of which by-product every blast furnace usually has more than it can consume. In such cases meters are

not warranted except under one condition, namely, when any part or all of the equipment is overloaded, then the introduction of meters may be the cheapest and most convenient way of increasing the capacity of the system.

It goes without saying that all meters should be owned and controlled by the central station or the distributing company, as that is the only way by which they can be given proper care and attention. The system of allowing each consumer to purchase and maintain his own meter, happily followed in but a very few installations, is naturally bound to make trouble for the supply company, for it will be charged with those deficiencies and misunderstandings which will inevitably arise, due to the consumer's own ignorance of the more or less delicate apparatus which he is handling. Besides this, such a system presents great temptation for tampering with the meter or the service, obviously a situation very much to be avoided.

Meters naturally require systematic care and attention, because even the most rugged machinery will not run forever without attention, and a meter is but a comparatively frail piece of mechanism. In the larger plants there is, of course, a field for a properly organized meter department, but in smaller installations the work has to be done by the one electrician, who is charged with the up-keep of all the equipment. In such cases it is not natural to expect that the same care and attention can be given as in those plants maintaining a meter department, but nevertheless one man can inspect a lot of meters, as compared with the formerly restricted possibilities, if he uses one of the several master or test meters now on the market. This type of instrument is immensely superior to the stop watch system, and should be found on the shelves of every central station operating any reasonable number of meters, as far more accurate results can be obtained with it than with any other way of testing, and in more rapid manner also.

In conclusion, may we urge upon all operating companies that they avoid, if they possibly can, the making of a separate charge for meter maintenance. There are few bills that a man receives more irritating than one for meter rental, and it is poor policy to irritate a customer. Rendering a bill for meter up-keep is not logical, because just as you do not itemize salaries, oil, insurance and fuel, when rendering your accounts, why then pick on the one item of meters and bill it separately, notwithstanding that the expenditure on them is but one, and a small one at that, of the many items that together go to make up the total cost of producing and distributing your output? Therefore lump all your costs together, and include them in your rate for current. Lastly, assuming that you have been charging meter rentals, and further, that you are facing a demand for a reduction in rates, may we suggest that the elimination of such a charge would be a concession that would probably satisfy your customers, and at the same time not cost nearly as much to you as an actual change in rates.



# Municipal Electrical System at Merritton, Ontario

**A New Method of Tungsten Street Lighting by Percival Mitchell,  
of C. H. and P. H. Mitchell, Consulting and Supervising Engineers**

Merritton, Ontario, has solved a problem in municipal lighting which undoubtedly stamps it as a pioneer in efficient, economical modern street illumination.

The town is located between the old and the new Welland canals, in the Niagara Peninsula, and extends from the top of the "Mountain," as the Niagara Escarpment is locally called, and the lower level, or between Thorold and St. Catharines. The generous lighting of both the canals has been described previously, and, standing on the mountain, the hundreds of arc lamps reaching as far as can be seen, all perfectly aligned, forms an excellent example for the lighting of the municipalities in the vicinity.

Previous to the summer of 1908, Merritton was supplied with light, and power in small quantities, by a system installed and operated by H. D. Symmes, of Niagara Falls. At the expiration of his contract for street lighting, the town bought the plant and goodwill and operated it municipally, making plans for extension and new equipment so as to completely light the town. The street lights included about twenty arc lamps and about ten incandescent lamps.

Within the limits of Merritton, about eight hydraulic power plants are developed, taking advantage of the fall corresponding to each lock of the old canal. Each plant develops in the neighborhood of 400 horse power for use in paper and cotton mills and in the Willson Carbide Company's works. Several of these are electrical, but, as their full capacity is in use in the industrial plants, none was available for use in the town so the proposed system had to be adapted to an outside source of power.

Several of the power companies distribute near the town and provide power of various characteristics. The Lincoln Power Company, subsidiary to the Cataract Power Company, and the Ontario Power Company of Niagara Falls, are keenly active and both offered very favorable terms to the municipality. The most important difference in the power supplied by the two re-

Power Company to supply 25 cycle power at 2200 volts from their 12,000 volt line. This entailed the building of a sub-station, the adapting of the old single-phase system to three-phase, changing transformers and meters

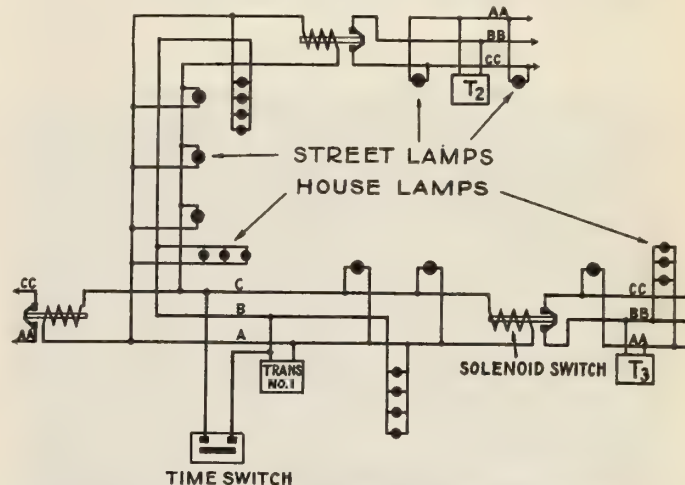


Diagram of Secondary Wiring, Merritton Municipal Electric System.

and providing a new street lighting system besides the extensions necessary for the commercial lighting. As but \$4,000 was available for this work the strictest economy had to be maintained in the whole construction.

Arc lamps, for other reasons than their elimination on account of the undeveloped state of the 25 cycle lamp, are not especially desirable in a small installation. The well treed streets of Canadian towns usually have the lighted areas confined to a small circle surrounding the lamp, and as the practice of locating arc lamps limits them to each corner on the main streets and to a very sparing distribution in the residential sections the expense of their up-keep does not bear a very attractive revenue in efficient illumination. The fact that the nominal 2,000 candle power rating for arc lamps is entirely too high and that 400 candle power is even probably a rating above the average seems to be little known among lamp users.

Arc lighting could have been accomplished by the use of motor generator sets or mercury rectifiers, but at a prohibitive capital and maintenance cost. Perhaps to-day an installation could be figured with less capital cost, due to the new 25 cycle lamp just placed on the market; the pronounced flicker of such a lamp, however, is undoubtedly unpleasant, so that its use will be considerably limited. A consideration of street illumination under these conditions should be of interest to a great many in anticipation of power generated from the same source, the Ontario Power Company of Niagara Falls, being distributed over a considerable portion of Ontario by the Hydro-Electric Commission's lines.

Available for use in Merritton were carbon filament incandescent lamps, Nernst and Tungsten lamps. The carbon lamps were easily disposed of when compared with the high efficiency of the Tungsten type and it was only the advent of the latter and its low cost and maintenance that decided against the out-door type Nernst which, with its arc lamp appearance, carried consider-



Tungsten Installation on Beech Street, Merritton, Ont.

spective companies is that the Cataract Company generate 60 cycle power, while the Ontario Power Company can only supply 25 cycle current. As all the apparatus in the town was for 60 or 133 cycles, to use 25 cycles meant replaced transformers, arc lamps and meters. A contract was eventually made with the Ontario



able weight with those who favored that style of lighting.

The Tungsten lamp is now familiar to all and an enumeration of its characteristics to compare with those of the ordinary incandescent lamp is all that is necessary to verify its position in the front rank of illuminating devices. The average lamp shows the following:

Consumption—1.25 watts per horizontal candle.

Life—Exceeding 800 hours.

Loss of candle power—Up to 10 per cent. during life.

Regulation—For 1 per cent. variation in voltage, 2.5 to 4 per cent. variation in candle power.

Color—White, comparing favorably to daylight.

Change during life—Color remains practically the same, bulbs do not blacken, candle power and efficiency show very little change.

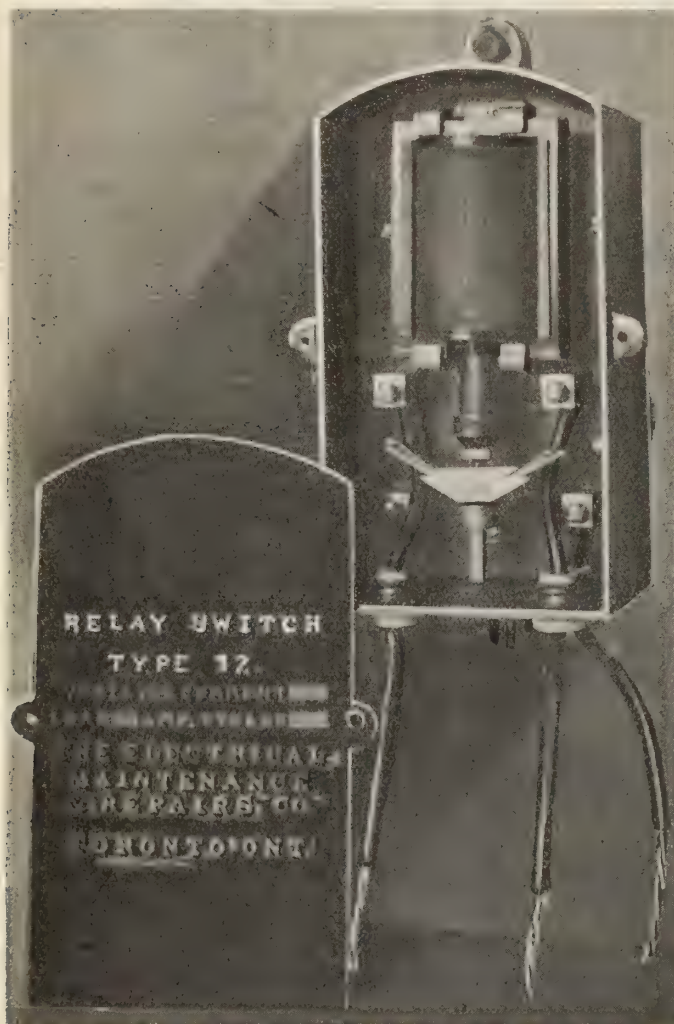
Tungsten lamps have been developed only in voltages

cut-out which short circuits the lamp when it has failed. Alternative systems of lamps in series include shunt boxes or adjustable lamp blenks in the power house with film cut-outs shunting each lamp; both these systems use multiple type lamps. The shunt box system is highly successful but the latter requires considerable attention.

A feature of the series system is that usually but one wire is required on a street, the circuit returning by another route. In a well laid out city this is practical, but in towns whose nucleus has been the intersection of two roads, the present requirements are for the return wires being on the same poles.

A series arrangement necessitates therefore, in the majority of cases, two copper lines, special socket devices, expensive series lamps, a constant current transformer and the space to put it in. Circuits such as these require a definite number of lamps installed with practically no margin for extensions. The shunt box system of series lines utilizes multiple lamps of lower cost than the series, as above, but requires the installation of the shunts and also has the limitations in lamps per circuit and extensions. But few satisfactory installations of a series system without the above apparatus have been made and no particular attention was paid to them.

From all considerations of the systems at present in



Solenoid Switch, Merrittton Municipal Electric System.



Merritt Street, Merrittton, Ont., lighted with Tungsten Lamps.

from 4.7 to 125. The lower voltages are for lamps in series, and those at the higher are for multiple use or on some types of series systems. The low voltage lamps possess a more rugged filament and consequently a life of about 1,000 hours, which is greater than that of the multiple lamp; the cost of the latter, however, is less than two-thirds the former.

In utilizing Tungsten lamps the economic problem has to be solved as to what system should be adopted. In series the lamps may be used at voltages from 4.7 to 43 and in candle power from 25 to 80; a system using such lamps as these is usually equipped with a constant current transformer at primary voltages from 1100 volts up, the lamps being strung in series loops of from 60 to 500. The socket of each fixture is provided with a film

use the characteristics of an ideal arrangement were quite easily selected: Multiple lamps of any type or candle power, arcs included, should be used; no transformers other than the house service transformers should be required, regardless of 24 hour power; extensions should be unlimited; a minimum of wire would be necessary and all lights should be controlled with one main switch. A system combining these features was designed and installed under the supervision of K. L. Aitken, Electrical Engineer of the city of Toronto, and the writer, as Engineers for the corporation of Merrittton, and the results have been highly successful.

The installation includes 200-32 candle power, or 40 watt, 110 volt Tungsten lamps, each with a 16-inch reflector on a three-foot, outside wired, Cutter bracket. These are fed from eleven transformers of various capacities; no increased transformer capacity, however, was arranged for on their account. The town hall, which is a splendid stone building, is centrally located and the main switch, a Hartford time switch, is placed in the superintendent's office. The clock is wound once a week and is set to close the switch in the evening and open at daylight. This arrangement eliminates all manual labor in connection with the system.

Referring to the wiring diagram, transformer No. 1



feeds the two secondaries A and B, which are for ordinary incandescent lighting and provide 24-hour current. The main switch, or time switch, as it is in this case, connects line C to the transformer, making it the same polarity as line B. The time switch being closed during the predetermined periods, allows the street lamps to be connected between A and C, making A common to both street and house systems; in this way maximum economy of wiring is obtained. At the ends of the street secondaries of transformer No. 1, shown branching in three directions, solenoid switches are located; these are arranged to draw up a plunger, when energized, to bridge the contact blocks connecting lines BB and CC, connecting in the transformers Nos. 2 and 3, respectively, so that the street lamps in the district served by these transformers are lit in unison with those of the central district. These street secondaries in turn operate similar switches when they enter the next transformer district. Here may be mentioned the only weak spot of the system, that, if a switch fails from any cause the other switches on the side remote from the central district are affected similarly; the perfected state of the switches designed for this purpose, however, make such a failure almost out of the question.

The switches, a photograph of which is shown herewith, are designed for operation on 99 volts and above, thus allowing for operation with 10 per cent. drop on the 110-volt lines. In lifting the plunger about 60 watts is required, while about 15 watts is required continually to hold it in contact position.

In the main sections of the town the lamps are placed on every pole while the remainder is very well lit with lamps on every other pole. The photographs reproduced herewith show the lighting on two streets which were previously illuminated with arc lamps; the arc system is not comparable in any respect to the new lighting.

Power, as was stated before, is supplied by the Ontario Power Company, of Niagara Falls, from a 12,000 volt three-phase line built from their St. Catharines feeder. The step-down transformers, choke coils, electrolytic lightning arresters, oil switch, graphic recording watt meters, etc., are placed in a substantial fireproof sub-station at the town limits. Canal crossings are made with 55-foot poles at the low level end of locks, allowing about 60 feet clearance above the water.

The maintenance of the street lighting, including power, interest and depreciation and lamp renewals, is less than \$1,000 a year, or less than \$5 per lamp, an extremely economical figure. For domestic lighting a flat rate is usually given as follows:

8	C.P. incandescent lamp	at 3 cents per week.
16	" " "	5 cents per week.
32	" " "	10 cents per week.

Where a meter rate is required, power costs 8 cents per kilowatt hour in addition to 5 cents per week meter rental. The town is in a splendid position to give special rates to power users and can obtain any quantity of power required for its customers.

The Council of 1908 were most active in bringing the municipal plant up to its present high standard and much credit was due to Richard Clark, Clerk of the town, and A. T. Smith, the Superintendent, now the secretary of the Electric Light Commission. Mr. K. L. Aitken, now Electrical Engineer of the city of Toronto, was retained as the consulting engineer, and on his assuming his Toronto work placed the work under Charles H. and Percival H. Mitchell, as consulting and supervising engineers, under whom it was put into operation.

## Recent Legal Decisions

**Validity of Patent Rights.**—This was the outcome of a suit brought by the General Electric Company to restrain the Morgan-Gardner Electric Company from the further infringement of the Bassett patent, granted March 20, 1894, in the manufacture and sale of certain electric motors for use on electric mining locomotives. The court held that the patent was still valid and the defendants had infringed. The Bassett patent relates to a form of railway motor in which the field frame is diagonally split so as to allow ready access to the armature or interior parts of the motor, without removing the motor from the locomotive or car to which it is attached, and in which the parts are thoroughly protected from injury. The form of motor held to infringe in this case is the one which the Morgan-Gardner Electric Company has been selling for a number of years as its standard motor.

**Right of Telegraph Company Employees to Railway Transportation Free.**—The case of the North American Telegraph Company v. Bay of Quinte Railway Company which was recently tried before Chief Justice Mulock, involved the question of the right to free transportation over the railway for the inspectors, linesmen and repairers of the telegraph company when travelling for any purposes whatever. The telegraph company claimed that they had the right to this transportation by two agreements with the railway company and that the transportation had been refused them. The action was brought to recover fares which had been paid for the employees. The defendants admitted a limited right on the part of the plaintiffs and made the counterclaim for certain relief. Chief Justice Mulock, after considering the evidence, dismissed the plaintiff's side with costs. Two items of the counterclaim were allowed. One of these was for damages because of failure on the part of the defendants to keep their telegraph lines in working order, and the other was for damages because of the plaintiffs not erecting and maintaining the telegraph line between the stations of Tweed and Bannockburn, according to an agreement which had been made. Two other items of the counterclaim were disallowed, one of these was for a declaration that the plaintiffs were bound to maintain the poles erected on the defendant's right-of-way at the date of the agreement. The other was a claim for a declaration that poles erected by the plaintiffs on the railway right-of-way in excess of those mentioned in the agreement, were the property of the defendants, subject to the plaintiff's right to string wires thereon.

A movement is on foot among Canadian manufacturers looking to the securing of reciprocal arrangements between Great Britain and Canada in regard to the patent law. It is thought, however, that some Canadian manufacturers might not be prepared to allow patents registered in Great Britain all the privileges afforded by the Canadian patent regulations, and the matter is at present hanging fire pending the receipt of further information on the subject.

The eight-hour day bill has met with so much opposition that it is considered probable that it will not be heard of again at the present session of Parliament.



# Chart for Calculation of Size of Copper Conductors

Useful and Accurate Method Outlined by Prof.

L. A. Herdt, E. E., Ma. E., McGill University.

For the calculation of the size of copper conductor in alternating current transmission lines the ordinary vector diagram, fig. 1, giving the relation of the e.m.fs. on line, load and generator, is well known.

Mr. R. D. Mershon in his article originally published in the "American Electrician," June, 1897, and reproduced in the "Electric Journal" of March, 1907, worked out a chart as an extension to this vector diagram and with this chart the drop in alternating current lines can be easily calculated. Assuming the size of wire and knowing the amount of power to be delivered, the power factor of the load, voltage at the receiving end, distance of transmission and frequency, if the resistance volts and inductance volts are expressed as a percentage of

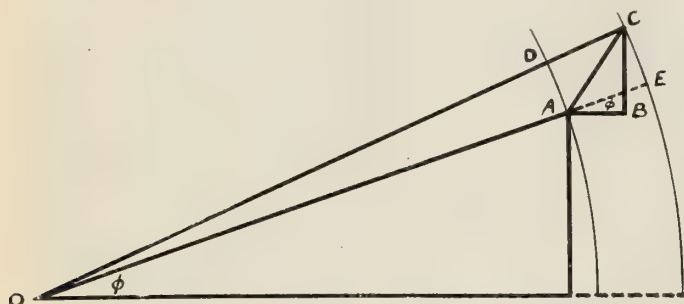


Fig. 1.—Current and E. M. F. Time-Phase Regulations.

the delivered e.m.f., the line loss and line drop are obtainable in per cent. form from the chart.

If specific losses and line drop are assumed, the problem which the engineer is called upon to solve is to find for a given amount of power delivered, at a given voltage, the proper size of the wires and their spacing. In this case the use of Mershon's chart will necessitate several trials before the size of the wires is derived.

The present article is intended to describe a chart giving the size of wire and spacing for an assumed line drop, which, expressed in per cent. of the receiver voltage, determines the regulation.\*

The foundation of this new method is the ordinary diagram of fig. 1.

The line drop is DC, the difference between OC the generator voltage and OA, the receiver volts. That is, DC, the radial distance between two circular arcs with OC and OA as radii, gives the regulation volts or line drop. In this diagram  $\phi$  is the angle between the receiver voltage and the load current; AC is the impedance drop of the line; AB the resistance volts, and BC the inductance volts.

If the line OA be extended to the outer circle, AE also represents the regulation volts and the angle  $EAB = \phi$ .

This diagram as a vector diagram can be drawn to scale for any particular problem in line transmission, but again it may be drawn showing the regulation volts or line drop per mile per ampere for any line.

Fig. 2 shows a chart with the resistance volts per mile of line per ampere as abscissas and the inductance

volts per mile of line per ampere as ordinates, for different sizes of wires at different spacings. In this way there is obtained a series of curves, one above the other, each being the locus of the point C in the vector diagram of fig. 1, for some particular spacings of the wires. These curves are referred to only the point A, and the line AB, in the vector diagram of fig. 1, for their position.

If this chart is placed at the point A, as shown in fig. 3, and the line OA is extended a distance AE equal to the line drop or regulation volts per mile of line per ampere, the size of wire showing this line drop will be given by the point of intersection of an arc drawn from the point O and radius OE, with the curve worked out for the particular spacing assumed. In fig. 3 this point, which is C, shows at the intersection, for 60-inch spacing, that No. 0 is the size of the wire.

If in place of the arc CE a line at right angles to AE from the point E be drawn, it will give practically the same intersection point C. By doing so one avoids all references to the point O and the whole diagram consists only of the chart shown in section squares. The chart can then be enlarged to any desirable size. The approximation employed in the method—namely, that a straight line at right angles to AE can be taken in place of the arc CE—evidently involves an error, but this error is very small in comparison with the changing of the size of the wire by one number on the B. & S. gauge. If, however, the size of wire is given, the regulation volts or line drop determined from the chart will be somewhat smaller than the true value. With leading current, or unity power factor of load, and frequencies above 60 cycles, the error introduced is large and the chart is, therefore, inaccurate for determining regulation.

For power factors—lagging current—less than unity and a line drop not exceeding 20 per cent. of the receiver voltage with frequencies of 60 and lower, the error is negligible and the use of the chart will give values of regulation as close as can be obtained by any other

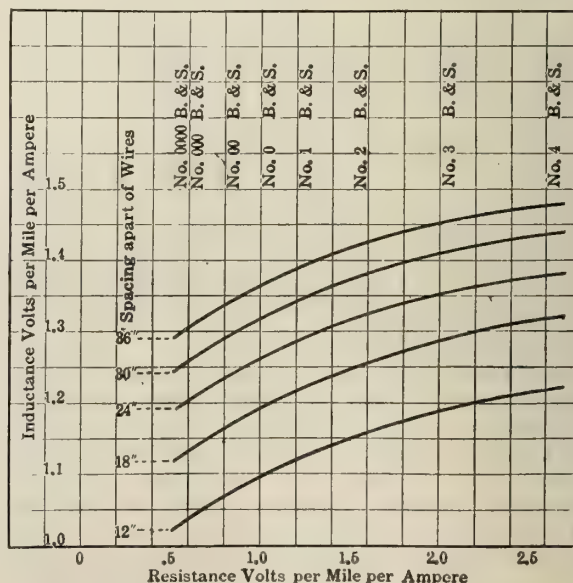


Fig. 2.—Chart of Resistance Volts and Inductive Reactance Volts.

\*In this paper the term "regulation volts" means the rise of e.m.f. that is necessary at the generating end to keep the received e.m.f. constant.



graphical method known to the writer, or even from analytical methods when using the slide rule to shorten the work.

Fig. 4 is a chart drawn for both 60 cycles and 25 cycles and for power factors from 70 per cent. to 100 per cent. and for sizes of wires from No. 0000 B. & S. to No. 2 B. & S. Curves are shown for standard spacings from 12-inch to 60-inch. (Resistance volts and inductance volts per mile of line per ampere are taken from the table found in "Drop in Alternating-Current Lines," by R. D. Merzhon.) This chart is printed on a separate sheet.

The chart (fig. 4) can be used to determine either:

A:—The size of wire for a given line drop or line regulation.

B:—The size of wire for a given watt loss in the line.

C:—The line drop and the watt loss for given sizes of wires.

D:—The effect on the line drop of the power factor of load with given sizes of wires.

As a matter of fact, any problem in line transmission, in whatever aspect the problem may be presented, can be solved with the use of this chart.

#### Uses of the Chart.

(A) When the line drop expressed in per cent. of the e.m.f. delivered is given, to find the size of the wires:

Calculate the line drop in volts per mile of line per ampere, and for the assumed power factor of load on the line marked  $\cos \phi$  lay off from the origin (point O) a length equal to this line drop in volts per mile per ampere. (The dotted circles drawn from point O give, on the different  $\cos \phi$  lines, different values of volts per

on the power factor line from point O represents to scale the line drop per ampere per mile of line. Multiplying this value by the amperes in the line and by the length of the line in miles, the value of the total line drop will be obtained, and this value can be expressed as a percentage of the e.m.f. delivered, thus giving the per cent. regulation.

To determine the line loss, follow the ordinate from the point on the chart representing the given size of wire and the spacing to the base line, the length cut off from the point O on the line representing resistance volts, gives the resistance volts per ampere per mile of line. Multiplying this value by the amperes in the line

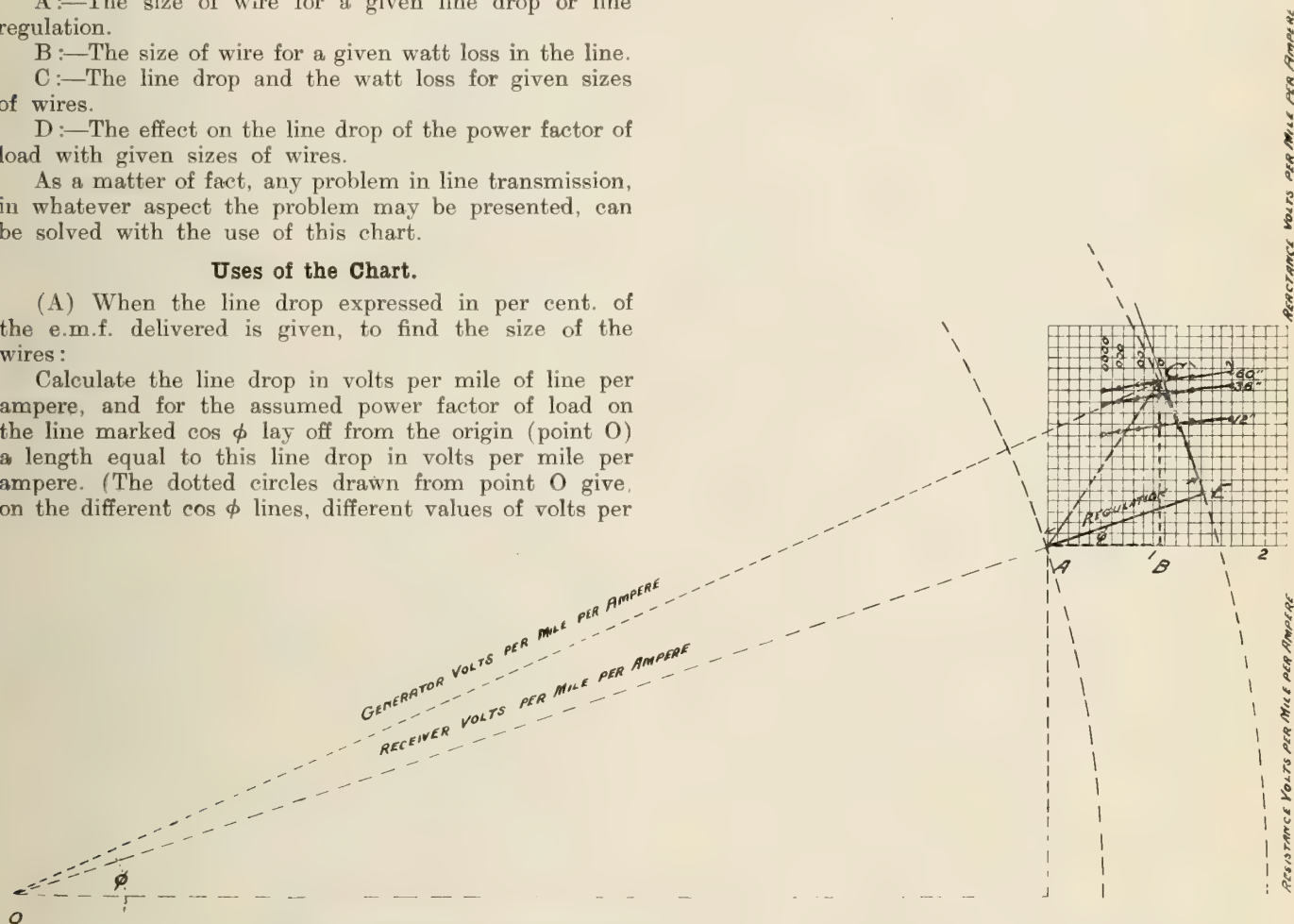


Fig. 3.—Diagram Showing the Significance of the Chart Illustrated in Fig. 2.

mile per ampere and this distance can thus be ascertained by inspection.)

At this point place a set square making a line at right angles to the  $\cos \phi$  line chosen above and its intersection with the curve on the chart for the spacing assumed will give the nearest size of wire to be used.

(B) When the watt loss in the line expressed in per cent. of the delivered power is given, to find the size of wire:

Calculate the volt loss per mile of line per ampere. This value is equal to the resistance volts per mile per ampere, and is measured along the base of the chart. Following the ordinate from this point to the intersection with the curves, the size of wire will be ascertained.

(C) When the size of wire and spacing is given, to find the line drop and line loss for a given power factor:

From the point on the chart corresponding to the size of wire at the spacing given, place a set square at right angles to the power factor line. The length cut off

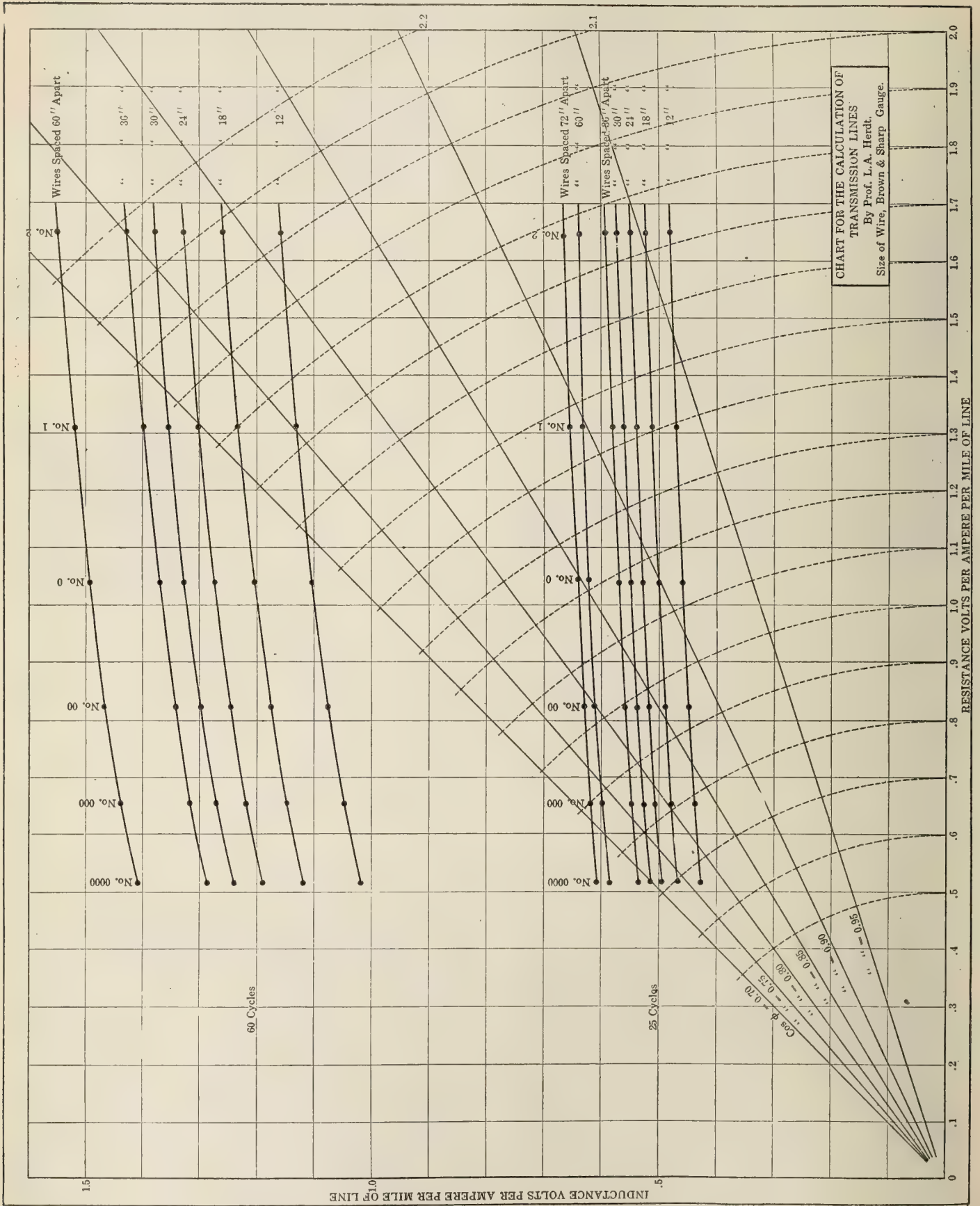
and the length of line in miles the volts lost are obtained. Again multiplying by the amperes in the line the watts lost, expressed as a per cent. of delivered energy, are obtained.

The above is thought to be sufficient to explain the construction and use of this chart. But a few examples may be of value:

#### Illustration of the Use of the Chart.

Example 1. Line drop assumed. Find size of wire. (Single-phase.)

Power to be delivered, kilowatts .....	250
E.m.f. at receiver, volts .....	2,000
Distance of transmission, feet .....	10,000
Power factor of load, per cent. ....	80
Frequency, cycles .....	60
Distance apart of wires, inches .....	18
Line drop allowed: 23 per cent. of received voltage.	
Find the size of wires.	





## (a) Calculation of line drop per mile per ampere.

$$\frac{250 \text{ kw}}{0.8} = 312.5 \text{ kva.}$$

$$\text{Line current at 2,000 volts} = \frac{312,500}{2,000} = 156.25 \text{ amp.}$$

$$\text{Line drop 23 per cent of 2,000 volts} = 460 \text{ volts.}$$

$$\text{Line drop per mile per amp.} = \frac{460 \times 5280}{10,000} \times \frac{1}{156.25} = 1.55 \text{ volts}$$

(b) On the chart place a set square on the 80 per cent. power factor line where the above value of 1.55 volts is shown, the intersection of the set square with the 18-inch spacing 60-cycle curve will give a size of wire of No. 0 B. & S. exactly.

Working this problem backward analytically, to check the above, and using the resistance volts and reactance volts per ampere for No. 0 B. & S. wires—namely, 0.197 and 0.228 ohm respectively, the line drop or regulation volts will be found equal to 460—that is, 23 per cent. of the receiver voltage.

Example 2. Line drop assumed, to find the size of wires— $\phi$  (Three-phase.)

A three-wire, three-phase transmission of which the conductors are symmetrically related may, so far as watt loss and line drop are concerned, be replaced by two single-phase circuits having no inductive interaction and identical with the three-phase line as to size, wire and distance between wires.

To calculate a three-phase transmission, calculate a single-phase circuit to carry one-half the load at the same voltage. The three-phase transmission will require three wires of the size and distance between centres determined for the single-phase system.

Power to be delivered (three-phase), horse-power	4,000
Em.f. at receiver, volts	40,000
Distance of transmission, miles	85
Power factor of load, per cent.	80
Frequency, cycles	60
Distance apart of wires, inches	60
Line drop, per cent.	20
Find the size of wires.	

## (a) Calculation of line drop per mile of line per ampere.

$$\frac{4000 \times 746}{0.8 \times 1000} = 3730 \text{ kva.}$$

$$\text{Single-phase equivalent load} = 1865 \text{ kva.}$$

$$\text{Current at 40,000 volts} = \frac{1,865,000}{40,000} = 46.6 \text{ amp.}$$

$$\text{Line drop allowed } 40,000 \times 20 = 8000 \text{ volts.}$$

$$\text{Drop per line-mile per amp.} = \frac{8000}{46.6} \times \frac{1}{85} = 2.02 \text{ volts.}$$

(b) On the chart place a set square on the 80 per cent. power factor line where the above value of 2.02 volts is shown the intersection of the set square with the 60-inch (60 cycle) spacing curve gives approximately No. 1 as the size of wire.

Example 3. Given the line loss, find the size of wire and also the per cent. regulation. (Three-phase).

Power delivered (three-phase), kilowatts	4,300
Em.f. at receiver, volts	30,000
Distance of transmission, miles	27
Power factor of load, per cent.	70
Frequency cycles	25
Line loss, per cent. of power delivered	10
Find size of wire for 24-inch spacing, also the per cent. regulation.	

Find size of wire for 24-inch spacing, also the per cent. regulation.

$$\frac{1}{2} \times \frac{4300 \text{ k.w.}}{0.70} \times \frac{1000}{30,000} = 102.4$$

or equivalent single phase current.

$$\text{Resistance volts lost for 10 per cent. line loss} = 70 \times 30,000 \times 10 = 2100 \text{ volts.}$$

$$\text{Resistance volts loss per ampere per mile of line} = \frac{2100}{27} \times \frac{1}{102.4} = .76 \text{ volts}$$

(b) On the chart find .76 on the base line giving the resistance volts per mile per ampere and vertically up to the 24-inch spacing curve for 25 cycles, the size of wire will be found to be No. 00 or No. 000 B. & S.

—Electrical World.

## Electrical Events

### Stationary Engineers to be Canadians

An amendment to the Stationary Engineers' Act has been introduced in Parliament, stating that no one shall be eligible to take the examination for a stationary engineer unless he is a British subject and has resided in Canada for at least three years. The Canadian Manufacturers' Association fear that this might cause serious trouble in times of labor difficulties and it is possible that the association will bring its influence to bear in opposition to the bill.

### American Electrical Engineers' Banquet

The American Institute of Electrical Engineers celebrated its silver anniversary in a dinner held at the Hotel Astor, New York City, on March 11th. The celebration was made the occasion for attempting various new electrical effects. A large ball-room was set as an actual scene, in Venice, the room being artistically electrically decorated. During the dinner President Ferguson stated that the institute had 6,600 members, not including 1,500 student members in university branches. Over fifteen sections and branches were represented, including Toronto.

### Canada's Electrical Imports

For the ten months ending January, 1909, Canada's imports in electric motors, generators and sockets totalled \$270,000. Out of this \$245,000 came from the United States while \$17,000 was imported from Great Britain. In other electrical supplies United States exports to Canada amounted to \$1,300,000. Great Britain sent in \$49,000. Germany and France supplied almost the same amount of \$4,000.

### The Gyroscope to Steady Vessels

In a paper read at the Royal Society of Arts, in London, by Mr. M. Wurl on a gyroscopic apparatus for preventing ships from rolling, the lecturer, who showed working models of the apparatus, said that it had been demonstrated that the contrivance greatly diminished heaving, pitching, and rolling, and experiments had shown that a vessel could be kept steady in a sea which, with no gyroscope, caused her to roll 20 degrees on each side. It might reasonably be expected that a wheel about six feet in diameter, running at 1,400 revolutions per minute, would keep steady a vessel of 2,000 tons displacement, with a moderate metacentric height, in any sea that was likely to be encountered.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Question No. 1.—We have installed a Westinghouse outfit, alternator, 3-phase, 80 k.w., 60 cycles, 2,200 volts, step-down oil transformers 2,200 to 105 volts, meter 7,200 alternations 100 volts, 21 arc lamps on a 35-light regulator, and we have a mile of No. 4 wire to distribution. What will be the effect on the equipment of raising voltage at power house to 2,400 volts, and using 110-volt lamps? To compute the load on generator, do you take the sum of the three readings?

As we are about to light another nearby town from our plant, I would like an idea as to the best kind of tower to build. There are two stretches of nearly a half-mile across the river; there is an island in the centre. What kind of wire would be best for this work, and would aluminum wire be as costly as copper? We will deliver about 50 horse-power on this line.

Answer.—The effects on the various apparatus which you detail will be as follows:

Generator, and possibly also the exciter, a little increase in the heating, though so small as to be entirely negligible.

Transformers.—Ditto.

Meters.—No discernible effect whatever, as the heating in this class of apparatus is practically nothing, and the accuracy will be the same at either voltage.

Series arc lamps.—No effect whatever.

Regulator.—Same as generator and transformers.

Distribution line.—No effect whatever.

On the system as a whole.—The very good effect of getting about 10 per cent. more capacity out of it. We would suggest though that you do not use 110-volt lamps, but say, 112 or 114, as manufacturers can generally give you better lamps when of voltages higher than 110, and sometimes are willing to quote lower prices on them.

If your ammeters are connected one into each of three separate single phase circuits, which would mean that you were using six wires, you would multiply each reading by the voltage, and then add them together to get the total wattage. If you are distributing three-phase, and have an ammeter in each of the three wires, you should take the average reading of the three meters, multiply that by the voltage, and then by  $1\frac{3}{4}$ , which will give you the load on a three-phase generator.

The question of towers for a half mile crossing is one which could be decided only after a very full consultation of plans showing all the various details, and so we would suggest that you lay the matter before a consulting engineer. Aluminum would scarcely be strong enough for such a long span, in fact, you would probably have to use a bi-metallic wire or an all-steel cable. As a rule the price of aluminum is kept at a figure so as to make it just a little cheaper than copper, though both vary from time to time.

Question No. 2.—We are installing a street railway system in our city. Can you give us any information regarding actual operation of the "Pay-as-you-enter" car? Does it do away with the conductor and do bad coins accumulate in the railway's purse? Will it not block the car entrance?

Answer.—The "Pay-as-you-enter" car is used, so far as we know, by only one road in Canada, viz., the Montreal Street Railway. It has been such a success there, however, and the type of car they have developed has proved so good, that the system is gradually extending to other large cities, such as Pittsburg, Philadelphia, Brooklyn, etc. It is also probable that it will be introduced into Toronto the latter part of this year.

The scheme is undoubtedly good, and one that will become general in a comparatively short while, at any rate on roads where traffic is heavy. The advantages are many, the principle being, from the company's side, that it gets all the fares, and from the passengers', that once you are in a car you are there in comfort till you want to get out. Besides this, the conductor is always on the back platform, which prevents the car being started till people are completely on or off, obviously a big advantage to both passenger and company. All such cars have big, long rear platforms, so that quite a crowd can get on very quickly, the delays being far less than with many of the small cars in use to-day. A good smart conductor can make change, sell tickets, and issue transfers almost as quickly as the people can walk past him into the car. He gets very little bad money, as with the big fare box generally used, much like those in a theatre, he has a good chance of seeing all that goes in. Be sure and get a cross-seated car, using the same body for summer and winter, and one with both front and rear exits, if you install the "Pay-as-you-enter" type."

For more detailed information we would refer you to the Montreal Street Railway, who will doubtless be very glad to give you all possible information. Also you might communicate with the authorities of the Chicago City Railway, who have just put on a few cars of this type, they being the first instalment of some 650 of that form now being built for them.

Question No. 3.—In direct current motors or generators, how many sections of a commutator should touch the brush at one time or what is the proper thickness of brush to use with segments one-fourth of an inch thick, not including insulation? Should the number of segments in a commutator be some multiple of the number of brush holders? In a generator with 70 commutator segments and four set of brushes, when two opposite set are entering on segments the two other set are at the middle of segments; would this cause any unusual strain on insulation between segments? This refers to a four pole, 125 volt, 40 k.w. generator?

Answer.—It is impossible to give any specific figure, as the best width of brush for any given machine is determined by its design, though, as a general rule, brushes are made to cover approximately three bars at a time. If you cover too many you get heavy sparking, due to local currents in those coils short-circuited by the brush, if you do not cover enough you get the same results, due to the fact that the current in the coils passing under the brushes has not had time to reverse before the bar leaves the brush.

2.—Not necessarily, sometimes it is and sometimes it is not. In the machine you describe, divide the commutator into four equal parts, and set each of the four holders one-fourth of the way behind the other. If one or more holders spark, while the others do not, rock the



whole four backwards or forwards until you find the non-sparking position for those holders that are giving trouble. Then reset them, backwards or forwards as the case may be, the amount by which you have had to move the rocker arm. That will, of course, result in unequal spacing of the four holders, but it will probably eliminate your sparking, which is the end in view. If all the brushes spark badly there is probably something a little out in the design, and the matter should be taken up with the makers. If you prefer to experiment before doing this, try first a thicker brush, and then a thinner one if that does not work. Sometimes cutting half an inch or so of each pole horn makes a great improvement.

Question No. 4.—(a) Is it all right to ground lightning arresters in a pond with a muddy bottom?

(b) Is there any more danger in a power house through an electric storm, to the operator, than anywhere else?

Answer.—(a) It is all right to do this, that is, it will produce no bad results, though we would say that it was not by any means a perfect ground. In view of this, we would advise you to connect your ground wire onto something else as well as to the plate or casting which you are (presumably) using in the pond. For instance, if you have a water pipe available connect to it, the bigger the better, right onto the main if you can get there.

(b) No, probably less, because any lightning discharge which might strike in that neighborhood would almost certainly go to some of the lines leading into the power house, and then be taken care of by the arresters, whereas if one were outside, away from any line, a discharge in your vicinity might select you as part of its path to earth.

Question No. 5.—Would you kindly inform us the price paid by Canadian consumers per electrical horse power in quantities of 50 to over 1,000 horse-power.

Answer.—It is almost impossible to give a definite answer to your question, because prices vary so much, depending on the method of charging, the relation between the consumer's peak load and his average load, the hours during which power is used, whether it is 10-hour power or 24-hour power, and the locality.

Speaking generally, as such a broad question can be answered only in general terms, we would say that for blocks of about 50 horse-power the price would run from, say, \$50 to \$60 per horse-power for very intermittent work, such as operating a hoist, down to \$35 to \$40 as the price for all ordinary work with motor of about 50 horse-power capacity. For 1,000 horse-power the price would run about \$25 per horse-power per year. The above figures, with the exception of the first two, are for a service of 10 hours per day; for 24-hour power they would be approximately 50 per cent. higher.

Question No. 6.—We are having trouble with our lighting system. Two 30 k.w. and 15 k.w., 110-volt multipolar machines, compound wound, are connected in series on the three-wire Edison system. The 15 k.w. machine appears to be in A1 shape, but persists in reversing its polarity. For three weeks it was necessary to change the wires on the terminal block in order to have positive wire connected to negative pole on the 30 k.w. machine, when changed everything runs smoothly for about two nights and then it is necessary to again change the wires, which necessity is indicated by volt-

meter and ammeter pointing in the wrong direction and lights burning about half voltage.

Answer.—It is hard to say what is causing your trouble, J.H.S., unless it be that you are experiencing a number of short circuits on your line. Trouble such as this will frequently reverse a generator, particularly if it be shunt wound, or even more so if the series field should be reversed and so be opposing instead of aiding the shunt winding.

The simplest remedy that we know of is to exchange the shunt windings or the two machines, so as to excite each of the fields from the other armature, and not have each machine self excited, as they probably are at present. With the new arrangement the reversal of either machine would reverse the other one also, and thus keep the system three-wire. An alternative arrangement which would have the same effect would be to excite both fields from either one of the armatures.

### Toronto Electrical Engineers Meeting

Mr. Chas. F. Scott, consulting engineer for the Westinghouse Electric Manufacturing Company and past president of the A.I.E.E., made the address before the Toronto section of that society at their meeting on March 19th. Mr. Scott discussed the developments of power transmission apparatus, touching first on the transformer, and outlining the different difficulties that had obstructed the progress of the designer as he attempted to enlarge it. Slides were shown illustrating the various methods used in increasing transformer capacity. Passing from the transformer, Mr. Scott showed interesting illustrations of both the earliest and the most modern alternators; alternating current, the factor that has made power transmission at all possible, was unknown when Mr. Scott attended college. It was fortunate for Canadians, he said, that a method so applicable to our water power resources had been almost perfected in the alternating system. A slide illustrative of the application of motor power in the home brought from Mr. Scott an expression of the importance of power house and central station managers catering to this class of trade. The manufacturer should be interested also, for it meant the sale of thousands of motors.

Mr. Scott drew attention to an interesting item when he stated that the cost of electric power to-day is only two per cent. of the cost of labor. Therefore he advised the judicious use of power by manufacturers. They could in many cases by its introduction save from five to ten per cent. in operating expenses.

Several slides were shown depicting the modern insulator and its tests. Various troubles have been met with in designing this particular portion of transmission apparatus, chiefly owing to the fact that the stress is not evenly distributed over the insulator. One engineer had spared no expense in material in designing a glass insulator but eventually it had broken down. Mr. J. Stanley Richmond, in the discussion following Mr. Scott's address, thought a more efficient insulator would have been made by having the glass arranged in thin strips with insulating material between strips. Mr. Scott was asked by Mr. K. L. Aitken, electrical engineer, when the use of the synchronous motor would be advisable. Mr. Scott replied that he thought it best to use the induction motor generally; the synchronous machine to be used only when special occasions demanded it. Mr. Sothman, of the Hydro-Electric Commission; Mr. Rose, of Hamilton; Professor Roseborough, Toronto University, and others also spoke.



# Nova Scotia's Proposed Public Utility Bill

## A Measure to Supervise and Limit the Powers of Light, Heat and Water Companies

The Government of Nova Scotia has introduced a measure to appoint a Board of Commissioners of Public Utilities to have general supervision of all water, light, heat and power questions. This will concern many central station managers and others interested in lighting and heating plants. We invite expressions of opinion on the bill, the chief clauses of which we publish below:

"Public Utility" means and includes every corporation, company, person, association of persons, their lessees, trustees, liquidators or receivers appointed by any court and every city, town, municipality or country that now or hereafter owns or may own, operate, manage or control any plant or equipment for the conveyance of telephone messages or for the production, transmission, delivery or furnishing of heat, light, water or power, either directly or indirectly to or for the public.

The Governor-in-Council may appoint three persons who shall constitute a Board of Commissioners of Public Utilities, and shall designate a chairman thereof and appoint a clerk for such board who shall keep a full and faithful record of its proceedings and serve such notices and perform such duties as the board may require. Said commissioners and clerk shall be sworn to the faithful performance of the duties of their respective offices before entering upon the discharge of same.

The said commissioners and clerk shall be paid such salary and expenses as the Governor-in-Council determines.

The annual expenses of the board, including the salaries of the commissioners and clerk, and the compensation to referees, shall be borne by the several public utilities according to their gross earnings and shall be apportioned by the board, which on or before the first day of July in each year shall assess upon each of said public utilities its just proportion of such expenses in proportion to its gross earnings for the year next preceding that in which the assessment is made, and the sum so assessed on any public utility may be recovered from it, with costs, by civil action or proceedings at the suit of the chairman of the board in any court of competent jurisdiction.

Every public utility is required to furnish reasonably adequate service and facilities. The charge made by any public utility for any heat, light, water or power produced, transmitted, delivered or furnished or for any telephone message conveyed, or for any service rendered or to be rendered in connection therewith, shall be reasonable and just, and every unjust or unreasonable charge for such service is prohibited and declared unlawful.

Every public utility shall annually make a return to the board in a form and at a time prescribed by said board. Such return shall set forth the amount of its authorized capital, its capital paid up, its liabilities and assets, its receipts and expenditures for the preceding year, its dividends paid or declared and such other statements showing its financial condition as may be required by the board, and such returns shall be signed and sworn to by the principal officer or person engaged in the management of such public utility at the time of the making of said return.

Every public utility shall, on or before such date as is fixed by the board, file with the board schedules which shall be open to public inspection, showing all rates, tolls and charges which it has established and which are in force at the time, for any service performed by said public utility within the province, and until such schedules have been filed the rates, tolls, and charges shall not exceed those charged at the time of the passing of this Act.

No change shall, after the filing of said schedules, be made in any of the rates, tolls or charges, except upon thirty days notice to the board, and all such changes shall be plainly indicated upon existing schedules, or by filing new schedules in lieu thereof thirty days prior to the time the same are to take effect; provided that the board upon application of any public utility may prescribe a less time within which a reduction may be made, or within which additions may be made to such schedules in respect to services for which no rates, tolls or charges are thereby provided.

No public utility shall charge, demand, collect or receive a greater or less compensation for any service performed by it within the province than is prescribed in such schedules as are at the time in force, or demand, collect or receive any rates, tolls or charges not specified in such schedules. The rates, tolls and charges named in the schedules, so filed as aforesaid, shall be the lawful rates, tolls and charges until the same are altered, reduced or modified as provided in this Act.

Upon a complaint made to the board against any public utility by any municipal corporation or by any ten persons, firms or corporations, that any of the rates, tolls, charges or schedules are in any respect unreasonable or unjustly discriminatory, or that any regulation, measurement, practice or act whatsoever affecting or relating to the production, transmission, delivery or furnishing of heat, light, water or power, or the conveyance of telephone messages, or any service in connection therewith is in any respect unreasonable, insufficient or unjustly discriminatory, or that any service is inadequate or unobtainable, the board shall proceed, with or without notice, to make such investigation as it deems necessary or expedient, and may order such rates, tolls, charges or schedules reduced, modified or altered, and may make such other order as to the modification or change of such regulation, measurements, practice or act as the justice of the case may require, but no such order shall be made or entered by the board without a public hearing or enquiry first had in respect thereto.

Every public utility which directly or indirectly, by any device whatsoever, charges, demands, collects or receives from any person, firm or corporation, a greater or less compensation for any service rendered or to be rendered by it in or affecting or relating to the production, transmission, delivery or furnishing of heat, light, water or power or the conveyance of telephone messages or for any service in connection therewith than that prescribed as provided herein, or than it charges, demands, collects or receives from any other person, firm or corporation, for a like and contemporaneous service, is guilty of unjust discrimination which is hereby prohibited, and is liable to a penalty of not less than fifty dollars and not more than five hundred dollars.

No person, firm or corporation shall knowingly solicit, accept or receive any rebate, concession or discrimination in respect to any service in or affecting or relating to the production, transmission, delivery or furnishing of heat, light, water or power or the conveying of telephone messages within the province, or for any service in connection therewith whereby any such service shall, by any device whatsoever or otherwise be rendered free or at a less rate than that named in the schedules in force as provided herein, or whereby any service or advantage is received other than is hereby specified. Any person, firm or corporation violating the provisions of this section is liable to a penalty of not less than fifty dollars and not more than five hundred dollars for each offence.

If any person, firm or corporation supplied with heat, light, water or power or telephonic connection by any public utility, neglects or refuses to pay the amount due for the same or for the rent of the meter or other articles hired by him, such public utility may discontinue the service and stop the supply. In such cases the officers, servants or workmen of the public utility may, after twenty-four hours' notice, enter the premises of such person, firm or corporation, between the hours of nine o'clock in the forenoon and four o'clock in the afternoon and separate and take away such meter, appliances or other property belonging to the public utility and disconnect any pipes, wires or fittings or other works, whether its property or not, from the main pipes or wires of the public utility.

Notice of the hearing of any application for the approval of or providing for an increase or decrease in the charges taken or collected by any public utility, unless otherwise ordered by the board, shall be given by advertisement in one or more newspapers published in the county, city or town where such change of rates or charges is sought for a period of not less than twenty days. If no newspaper is published in such county, city or town, said notice shall be published in a newspaper which circulates therein.



At any hearing or enquiry the board may hear evidence upon oath and may compel the attendance before it of witnesses by subpoena under the hand and seal of the chairman of the board, and may be subpoena duces tecum compel the production by any witness of any papers, books or documents; and any witness who is served with a subpoena and paid the amount of money allowed to a witness for travel and attendance in the Supreme Court, shall be subject to the same penalties for disobeying such subpoena as he would be liable to had the subpoena been issued out of the Supreme Court. Any member of the board may administer the oath to any witness.

The board may, from time to time, make, revoke and alter rules and regulations for the effectual execution of its duties when approved by the Governor-in-Council.

Any public utility or any person aggrieved by any decision or order of the board, may appeal therefrom to the Governor-in-Council within thirty days from the notice of said decision, and the Governor-in-Council shall decide any question of fact upon the evidence taken before the board, and may confirm, modify, vary or reverse such decision or order.

Every person, firm, corporation or public utility neglecting or refusing to obey, comply with or carry into effect any rule or order of the board or of the Governor-in-Council made under the provisions of this Act, is liable to a penalty of not less than fifty dollars and not more than five hundred dollars.

### Crude Wiring Methods of Earlier Days

About two years ago the attention of the Ontario Government was directed to the obsolete and dangerous condition of the electric wiring throughout the Parliament Buildings by H. F. Strickland, electrical inspector for the Canadian Fire Underwriters' Association, Toronto. In keeping with the promptness, which has distinguished the Whitney Government, their report was immediately taken up and referred to the Public Works Department, and after the matter had been laid before Dr. Reaume it was decided on the recommendation of the electrical inspector that the work of re-wiring the buildings should be immediately taken in hand. Mr. Strickland was then commissioned by the Ontario Government to prepare complete plans and specifications and tenders were called for, for the complete re-wiring of the buildings in question. The contract was subsequently awarded to the James Morrison Brass Manufacturing Company, of Toronto, together with a supplementary contract for taking down and re-wiring the electric fixtures. This work has now been completed and some points in connection will no doubt be of interest to the trade.

The original system, or what might be called the absence of any system, is now substituted by a complete 240-480-volt 3 to 2 wire system. The main feed wires are brought in at the east and west end respectively in lead covered paper insulated cable laid in tile ducts in the concrete floor of the basement. This lead cable terminates in a marble switchboard located in the centre of the basement. From this switchboard separate mains in iron conduit rise to each panel board throughout the building. The complete job reflects very creditably upon parties engaged in the work. The switchboard is a model of excellence in every respect, being set on a neat angle iron frame with grill work ornamentations and enclosure, the conduits being made neatly and securely brought into the back of the switchboard with more than the usual care and symmetry of finish. Separate conduits are run to each elevator in the building from separate switches on the power panel. The switchboard is approximately 98 x 78 inches, being made of polished blue Vermont marble 1½ inches thick. The panel boards, together with the switchboard, were furnished by the Canadian General Electric Company.

One can gain a slight idea of the great amount of wire which had been originally used, from the fact that there were some two or three tons taken out of the walls and quite as much

more left abandoned. Throughout the entire building the branch circuits were merely laid in grooves in the upper floor and then the second flooring nailed down on top of them. One significant fact about some of this wiring which was pulled out was the excellent preservation of the rubber covering, which, according to Mr. Strickland, appears to be much better than the rubber covered wire now found on the market. Many dangerous defects were removed. Such things as old worn out flexible cord run under floors, and carrying in some cases considerable loads, were quite common, and in many places this flexible cord was merely run through floors where the scrub woman furnished it with a liberal supply of soapy water. The possibilities of trouble from defects of this description can be readily understood by those familiar with electrical work, and it is unnecessary to add that there were plenty of warnings from fire at different times in these buildings.

Visitors to these buildings cannot help being impressed with the excellent manner in which the panel boards have been designed and installed. The boards are set in steel cases with marble gutters, the steel boxes having been first of all securely set in cement, and the entire panel has then been neatly trimmed with oak and provided with oak doors and brass trimmings.

Owing to the construction of the building almost insurmountable difficulties were encountered in running in the new wiring. The contractors were not allowed to run on the ceilings and were greatly restricted in taking up flooring. In spite of these difficulties, however, the most shrewd observer will find little or no marks of damage of any kind in the building, and little or no complaint was heard from the officials of the building, owing to any of the work. The old wire when removed from the electric fixtures was found to have suffered the most from depreciation, the rubber in some cases being perfectly useless, having dried up and become very brittle and could in some cases be easily pulled off the wire, braid and all.

One or two slight mishaps occurred during the construction of the work, one of which nearly resulted in a serious accident. One of the members of Parliament, during the session last spring, was surprised to see a large sheet of stained glass fall on the floor and smash to a thousand pieces, passing so close to him that he felt the wind from it. This sheet of glass was a large light through which an electrician put his leg, and was located in one of the large skylights over the centre corridor of the building. Both the electrician and member of Parliament were badly frightened.

Other accidents were of a minor nature, a few of the electricians having for the moment forgotten that lath and plastered ceilings are not calculated to carry the weight of a heavy man, consequently there was a decided dropping of lath and plaster when these moments of forgetfulness took place. Taking it all round, however, the contractors are to be congratulated upon the freedom from complications and accidents, many of which were predicted by the unsuccessful tenderers.

The wiring has been tested out with the Evershed Bridge Megger, and only one slight ground on one small branch circuit was discovered, which was promptly removed, and the insulation resistance with everything on showed up excellently, running up to between two and three million ohms between all conductors and the ground. This testing was an anxious moment for both engineer and the contractors, who were both relieved when the circuits were tested, and showed up in some cases to infinity.



# Electric Railway Department

## The Wearing Qualities of Electric Railway Gears and Pinions

In a paper before the American Society of Mechanical Engineers recently, Mr. Norman Litchfield gave some interesting data on the action of gears and pinions under heavy electric railway service. In the operation of ordinary street railway motors the gearing is not a serious factor on account of the low horse power required and it is not until the equipment becomes similar in proportions to that of a steam railroad with congested traffic that its importance begins to be felt. With the installation of electric train service on the Manhattan Elevated Railway in 1901, however, the gearing question forced itself on the attention of the engineers through the large number of failures immediately occurring. On the New York Subway equipments the breakages were still more numerous, for these trains are more powerful than any heretofore used, an eight-car subway express train having motors aggregating 2,000 horse-power, equivalent to a locomotive of about the same power as the new electric locomotives of the New York Central lines, but differing from the latter in that all the power is transmitted by gears, while the Central's locomotives are gearless.

It is evident that the greatest work done by the gearing on any locomotive is during the period of acceleration, and that for a given mileage the total amount of work done will depend upon the rate of acceleration, weight accelerated per gear, and total number of such accelerations or starts. During the evening rush hours in the New York Subway, the total load per gear is about 35 tons, and this weight has to be accelerated at the rate of 1.25 miles per hour per second every third of a mile, that being about the average distance between stations.

The electrical operation of the Manhattan Elevated was commenced some three years previous to the opening of the New York Subway, and the earlier experience was therefore with the equipment for the former. The initial gearing installation on the 125 h.p. motors consisted of wrought steel pinions and solid cast steel gears of 3-diametrical pitch, this pitch being adopted on account of the economical current consumption thereby obtained. The pinions at once began to fail at the rate of about 15 per month. The failures continuing, it was decided to withdraw all of the gearing then in service and replace it with  $2\frac{1}{2}$  pitch on account of the greater tooth section thereby obtained, although, as before stated, this meant some loss in economy of current consumption. This change practically ended the failure of the pinions, but not entirely of the cast gears, and it was decided that greater reliability could be obtained by adopting a composite type of gear consisting of a cast steel centre on which a wrought steel rim was shrunk. This combination of a wrought steel pinion and wrought rim gear of  $2\frac{1}{2}$  pitch has proved generally satisfactory for the elevated service, and the improvement to be looked for is therefore in the line of greater wearing life.

On the Subway Division the motors are of 200 horse-power each and the originating gear equipment consisted of solid cast steel gears with wrought steel pinions, diametrical pitch  $2\frac{1}{2}$ , and teeth of the Brown and Sharpe standard  $14\frac{1}{2}$  deg. involute. As on the Manhattan Division, so on the Subway, it soon became evident that the design was not proper, but in contrast to the Elevated it was the gears which first caused the trouble.

The cast steel gears, therefore, were all scrapped and replaced by the wrought rim type. (It should be stated that the idea of these composite gears was induced by the experience of the Interborough Company, although they were first brought out in connection with the proposed electric motor car equipments for the New York Central Lines.)

This improvement practically ended the gear breakage, but unfortunately the pinions began to go, the breakages averaging over one a day, and furthermore it is found unsafe to run a pinion the teeth of which measure less than 3-16-inch at the top. The company is therefore compelled to scrap material which should be available for wear.

Three suggestions have been advanced by the gear manufacturers to eliminate the trouble:

- (a) Diametrical pitch less than  $2\frac{1}{2}$ .
- (b) Steel with elastic limit of 90,000 pounds per square inch and over as compared with the present 45,000.
- (c) 20 degrees stub teeth.

The first suggestion the company is unable to accept on account of some local conditions, but the combination of the other two seems to have possibilities of success and the company is now replacing all the gearing with specially treated carbon steel with stub teeth.

## The Composition of Trolley Ears

Trolley ears are a class of material which the average electric road purchases with no regard to composition, anything which is "red" usually being considered good enough. The first cost is small and therefore most roads buy with no specifications other than dimensions. The cost of frequently replacing, or the delay to traffic and possible danger to life from a dangling wire is, however, a serious item, and one which can be materially reduced by using a metal of suitable composition.

A city system, handling a heavy traffic where delays cost money, recently had considerable trouble by the frequent breaking of ears, which they were purchasing of a reputable manufacturer. Two of the ears were sent to a laboratory for analysis. The report from the laboratory showed the following compositions:

	Wheel No. 1.	Wheel No. 2.
Copper .....	60.5	78.3
Zinc .....	38.5	16.5
Lead .....	0.4	4.4
Iron .....	0.1	0.2
Tin .....	...	0.5

The analyses show plainly the cause of the trouble: No. 1 is made of the ordinary 60-40 brass and is not strong enough for such work; No. 2 is evidently from scrap composition and also fails to have the required strength.

This company is now buying under a strict specification. A sample from every shipment is analyzed and the number of breaks is very materially reduced.

To find leaks in a compressed air system apply soap-suds with a small brush to joints or fittings. It makes no difference how small the leak may be, it will at once show up by the foaming soap bubbles.



## The Luminous Arc Headlight

At the meeting of the Central Electric Railway Association at Indianapolis recently, Mr. W. S. Culver delivered an address upon "The Luminous Arc Headlight," in which he said in part:

The luminous arc headlight is very similar in appearance to the carbon headlight, and consists of a galvanized sheet steel casing about 15 inches in diameter, 9 inches deep, reinforced by iron door castings, making a rigid structure. The mechanism is not of a regulating type, but so arranged as to strike an arc of a fixed length. With the slow rate of burning of the electrodes there are sufficient interruptions of the circuit incidental to regular operation to maintain the arc within safe voltage limits. This permits of a more simple and rugged construction, suitable for railroad service as found in high speed interurban cars. The lamp, together with the reflector, is held in place by one wing nut on the back of the casing and can be readily removed for inspection or repair.

In order to protect the arc from air, which might otherwise get between the sections of the glass and the door, there are two separate panes used with the joints overlapped. The use of sections or slats instead of solid glass lessens the liability of breakage from extreme temperature changes.

At the focus of a highly polished metal reflector is the luminous arc. The upper electrode is a T-shaped copper forging and having a life of 2,000 to 3,000 hours, it may be considered as non-consuming, and being stationary, the arc remains in the focus of the reflector. This upper electrode is held at the bottom of the draft chimney, where the natural draft keeps the arc burning on the electrode ends and carries off the fumes from the electrodes. The chimney is covered at the top by a hinged shield so designed as to protect the arc from high winds and rain, and makes the tubes easily accessible for cleaning with a brush furnished for the purpose. The lower electrode consists of a sheet iron tube,  $\frac{1}{2}$  inch by 5 inches, filled with the materials before mentioned which give the necessary vapor in the arc steam to produce an efficient luminous arc.

The headlight not only illuminates the track for a distance of 1,200 to 1,800 feet ahead of the car, but the width of the beam is very noticeable.

The lighting of a considerable area on each side of the track is found to be of great assistance to a motorman in approaching and taking curves; it also is an additional insurance against collision with vehicles, animals or persons approaching the track. There may, however, exist certain localities where a narrower and farther reaching beam of light is desired, and to meet this demand the headlight can be furnished with a Mangin mirror instead of the standard type of reflector.

The luminous arc headlight is designed to operate at 75 volts and 4 amperes. To take up the difference between the line potential and arc potential there may be used a resistance. While the use of such a resistance gives satisfactory operation of the headlight, incandescent lamps for lighting the interior of the car may be employed instead, thereby utilizing the energy represented by the difference in voltage between line and arc. Different combinations of incandescent lamps can be used to make up this resistance, according to the number of lamps required to light the car. One very satisfactory combination is a group of sixteen 32 c.p., 11-volt lamps, consisting of four series of four lamps each, connected in multiple. If it is desired to increase the number of lamps in the car, thirty-two 16 c.p. lamps may be used, in eight series of four lamps each, connected in multiple.

If it is desired to keep these incandescent lamps

burning when the headlight is removed or while it is being transferred from one end of the car to the other, a substitutional resistance unit may be employed, wired up to a pair of two-way snap switches, one placed at each end of the car. This arrangement permits the headlight to be turned on or off without interfering with the incandescent lamps.

Taking advantage of the reduction of light with reversed current, a reversing switch may be supplied by means of which the light can be dimmed when required for certain sections of the route, the dimming due to the current reversal being carried still further by a slight reduction of the current.

If too great a reduction of light by this method of reversal and low current is attempted, a point of unstable operation is reached; so for the cases where an extreme reduction of light may be required a type of the headlight is available having an incandescent lamp mounted in front of the reflector, the operation of the switch transferring the current from the arc to the incandescent lamp.

The headlight may be so adjusted that satisfactory operation will be obtained with a widely varying line voltage, it being obvious, however, that there is a low limit of line voltage below which operation will be unsatisfactory, this limit being lower with the normal arc than with the arc reversed and the extra resistance in circuit.

Adjustments should be made to best suit average local conditions, it being possible to get satisfactory operation on the low voltage existing between feeding-in points on the average interurban road; although if unusually low voltage points exist, it may be necessary to carry a somewhat shorter arc than usual.

## Explanation of Circuits to Shop Employees

One of the most difficult problems in the instruction of motormen and shop employees is the explanation in a satisfactory way of the circuits of car controlling devices, both of the hand and contactor type. The ability to read electrical diagrams in terms of the actual apparatus is not readily acquired by men untrained in the more complex phases of motor and control relations; thus there is often a serious gap between the explanation of car wiring by drawings and the following out of the various controller changes in the physical equipment. In one recent instance where the short-circuiting of the No. 2 motor on the transition point was in question before a gathering of car house men, a full-sized controller was mounted on the platform of the room, with a diagram of the motor and rheostat connections at one side, the size of the drawing being just sufficient to match each finger with a line of the diagram. Then as the handle of the controller was turned through different steps the course of the current through the controller could be followed, passing from the fingers to the diagram and thence through the various motor leads as drawn, back to the ground connection in the controller itself. The use of a diagram of practically the full height of the controller set up at the side of the case thus affords a most flexible means of emphasizing particular conditions. By a series of these large diagrams, made up for regular and emergency conditions, the detailed features of the apparatus can be made plain much more rapidly than through the ordinary method of following out small-scaled drawings entirely apart from any practical apparatus, and if colored lines are employed in addition, the explanation of circuit complexities will be reduced to such simple terms as to be readily within the comprehension of even the most untechnical.—Electric Railway Journal.



## New 25 Cycle Arc Lamp

The development of an arc lamp to operate with entire satisfaction on a frequency of 25 cycles has long been a bugbear with companies manufacturing this line of apparatus, on account of certain apparently unsurmountable difficulties that barred the way to a successful solution of the problem.

The prime reason for using a frequency of 25 cycles, in the majority of cases, is on account of its manifold advantages for power circuits, and an arc lamp on a power circuit has always been a more or less undesirable combination, especially when used on induction motor circuits. In addition to this is the objectionable flicker which would condemn its use in the eyes of the average customer whose idea of light is certainly not one which gives a light effect about on a parallel with an ordinary candle, from the standpoint of steadiness. A careful observation, however, of the effects of this light on objects a few feet away from the lamp will tend to modify this first impression very considerably, as the flicker is only slightly perceptible on the walls or floor of a room in which the lamp is burning, which makes it quite feasible to use the lamp in places where a steady light is a seeming necessity.

Engineers, however, realize that this feature is something which cannot be eliminated, and the only requisite that they demand is a lamp which will maintain an even arc and feed properly. This has been difficult to accomplish on account of the excessive pumping action of the mechanism, with a resultant chattering of carbons, all of which is due, of course, to the low rate of change and the magnetizing effect on solenoids, and the sluggishness of the armature. The Adams-Bagnall Company claim they have, after a long series of tests and and considerable experimental work, succeeded in perfecting a lamp in which these troubles have been eliminated, resulting in an operation that is fully as satisfactory as the standard 60-cycle lamp.

This has been accomplished by attaching the clutch to armature with two parallel helical springs in place of our standard spring and hook construction, and introducing an auxiliary dash pot so connected to the armature as to dampen the frequent and sudden movements of same, and thereby prevent pumping. Through the medium of the springs the armature is allowed a considerable range of movement and to yield to the restless condition which seems to be characteristic of the current at this frequency, without any visible effect on the clutch, and by such a combination the clutch shows no vibration or unnecessary movement. A valuable feature of this construction is the elimination of the usual tendency of the clutch to wear into the carbon, producing a rough surface, and often breaking it.

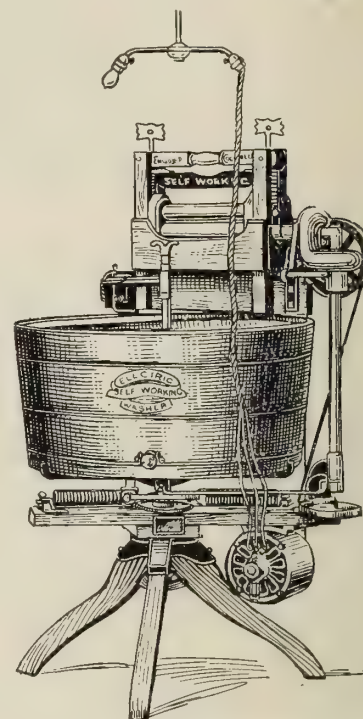
These lamps should be adjusted for a little lower voltage than the standard 60-cycle lamps, requiring but 70 volts at the arc instead of 75 to 80, with the 110-volt line. The length of the arc with this voltage should be 5-16-inch x 3-8-inch.

The structural features described above also aid very materially in making this lamp adaptable for power circuits with extreme variations of voltage. In fact, this idea has been kept in mind all through its development, dealing this to be the field that demanded such a type of lamp. Its adoption should result in the elimination of frequency changing machines, and a consequent simplification in the lighting outfit of an electrically driven plant using 25-cycle current from long distance transmission circuits. The R. E. T. Pringle Company, Limited, Montreal and Winnipeg, are Canadian agents for this company.

## Electric Washing Machines

Enterprising managers of electric lighting and power companies are always on the look out for new devices which they can place in the hands of their customers in order to increase the amount of current used. Any new device or machine which requires the application of electricity is therefore of vital interest to the central electric station man.

The "1900" Washer Company, 357 Yonge street, Toronto, have a very popular plan of co-operating with central stations for placing the "1900 Electric Washers and Wringers" in the hands of their customers. This plan, while it includes a profit on the machine, and an additional profit arising from the increased use of current, does not involve one cent of expenditure to the central stations, as the washers are sent to the cus-



Electric Washing Machine.

tomers on 30 days' free trial at the expense of the manufacturers.

The manufacturers of the "1900" Electric Washer and Wringer claim to have a perfect machine, which washes the biggest and the finest pieces alike. They claim also to show by actual experience that the machine not only increases the sale of current among a station's present customers, but actually gets new residence business, from one to three new customers per year for each machine sold.

## Ferranti Meters

The Ferranti Company, through their Canadian branch have met with considerable success in introducing their meters. Some good orders have been taken and users generally appear to be satisfied with the high efficiency of these meters. A large user made the statement recently that he was more than satisfied with the Ferranti meter and that his meter troubles had been reduced to a minimum. He also stated that the cyclo-meter dial was the best he knew of. The Ferranti poly-phase meters are claimed to fill a long felt want, both for efficiency and price.



## Publications Received

The Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., have published two new catalogues upon "Electric Motor Friction Brakes" and "Mercury Rectifier Battery Charging Outfits."

The Kelman Electric & Manufacturing Company, 612 North Main street, Los Angeles, California, have issued bulletin No. 4, descriptive of their high voltage oil switches and oil circuit breakers. The bulletin will be found of much interest to electricians.

Operation station engineers and railway superintendents will be interested to know that the manufacturers of the Evershed Bridge Megger, a direct reading resistance box, have issued a construction book on its use. J. F. B. Vandeleur, 3 Dineen Building, Toronto, is their Canadian agent.

Single phase motors, manufactured by the Century Electric Company, St. Louis, Mo., are described in a bulletin which has been issued by Harpell-Stokes, Limited, 312 Donald street, Winnipeg, Man., who are district sales agents for these motors. The catalogue contains a number of interesting and useful illustrations, and the motors are described in a manner which will appeal forcibly to all interested.

British Insulated & Helsby Cables, Limited, Power Building, Montreal Que., have issued two attractive booklets upon "Telegraph Apparatus" and "Telephone Apparatus." These booklets are rendered unusually complete by means of illustrations and descriptive text which afford good arguments in favor of the use of the instruments which are produced by this well-known company. Any one who is interested in these matters will do himself a service by writing for copies of the booklets.

The Garvin Machine Company, Spring and Varick streets, New York, have issued an illustrated catalogue of their duplex milling machines, profiling machines, vertical spindle milling machines, universal cutter and tool grinders, vertical, horizontal and automatic tapping machines, duplex drill lathes and gang drills. The catalogue is unusually complete and contains a number of half-tone illustrations and line cuts. It includes also descriptions of each machine published in English, German and French.

The American Bell Telephone Company of Boston have published a complete report of "The Deposition of Alexander Graham Bell," as made in the suit brought by the United States to annul the Bell patents. The deposition fills a book of 469 pages and opens with an introduction explaining the origin of the Bell patents, and the causes of the suit. The evidence given by Mr. Bell will prove of great interest to all who are interested in the development of the telephone. The book is substantially published and is gotten up in an extremely readable though plain style.

The McGraw Publishing Company have also published a treatise entitled "Shop Tests upon Electric Car Equipment," for inspectors and foremen, by Eugene C. Parham, M.E., and John C. Shedd, Ph.D. This is the first of two books designed to cover in a practical manner the testing of electric car equipment, with such instruments and other facilities as may be available in a car house. Simple explanations, illustrations and practical examples have been freely used and a number of ques-

tions have been appended for the purpose of rehearsing the reader's knowledge of the information contained in the books.

A volume which will be of much interest to the electrical profession has been published under the title of "General Lectures on Electrical Engineering," by C. P. Steinmetz, A.M., Ph.D. The volume is edited by J. LeRoy Hayden and published by Robson & Adey, Schenectady, N.Y. The lectures are general in their nature, dealing with the problems of generation, control, transmission, distribution and utilization of electric energy. They are written in an entertaining manner and give an unusual amount of information upon the subjects with which they deal. They are well illustrated and the book is very substantially published so as to make it one which will be both useful and attractive to its readers.

A treatise upon "Practical Calculation of Transmission Lines," for distribution of direct and alternating currents by means of overhead, underground and interior wires for purposes of light, power and traction has been published by the McGraw Publishing Company, 239 West 39th street, New York. The author is Mr. L. W. Rosenthal, E.E., Associate Member A.I.E.E. The book has been prepared with the object of providing a practical help in rapid and accurate calculation of transmission lines. Its chief mission is to substitute a direct solution for the trial method. The formulæ, tables and text have been prepared solely to meet the needs of the rapid worker. Such a book will be of great use as it will fill a need which has formerly been unsatisfied.

Allis-Chalmers-Bullock, Limited, Montreal, have favored the "Electrical News" with a copy of their 1909 calendar, which is one of the most attractive calendars that have reached us. It is handsomely designed in a rich, deep brown color, and contains a large calendar block, making it serviceable for office use. It is decorated with a cleverly conceived and well executed picture in colors entitled "The First Engineers." The picture portrays several beavers felling trees and piloting logs across stream for the purpose of building a dam. The painting on the calendar is from the brush of Mr. Arthur H. Hider, a well known Canadian artist, and was designed especially for Allis-Chalmers-Bullock, Limited. They manufacture all kinds of hydro-electric power machinery as well as electric motors, transformers, dynamos, switchboards, steam turbines, gas engines, Corliss engines, water wheels, mining, crushing, cement, flour mill and sawmill machinery, hoisting engines, turbine pumps, etc.

The Copp, Clark Company, Limited, Toronto, have issued a book upon "The Theory of Electric Cables and Networks," by Alexander Russell, M.A., D.Sc., a member of the Council of the Physical Society, and of the Institution of Electrical Engineers. The book is published by Archibald Constable & Company, Limited, 10 Orange street, Leicester Square, London, W.C. It is attractively published and extensively illustrated and will make a welcome addition to the libraries of all who are interested in electricity. It provides in an extremely readable form a useful amount of information regarding the phenomena connected with the flow of current along conductors and across dielectrics. It will also be of use to those who desire a working knowledge of the dielectric strengths of insulating materials and the electric stresses to which they are subjected under working conditions. An interesting chapter has been provided upon lightning conductors, and also a chapter upon the subject of electrical safety valves.



# Current News and Notes

## Armstrong, B.C.

The city has decided to buy the electric lighting plant at \$24,000. The power is generated at Davis Creek.

## Allanburgh, Ont.

Application is being made to the provincial legislature by the Niagara Peninsular Railway Company for permission to construct a branch line of railway through the townships of Humberstone, Crowland and Thorold to this village; also to increase the capital stock of the company to \$200,000.

## Brandon, Man.

The Maple Leaf Milling Company may put in an entirely new power plant. Mr. J. S. Barker is general superintendent of the company.

## Beamsville, Ont.

This village is about to take over the electric lighting system from the company which has operated it heretofore.

## Belle Plaine, Sask.

The Stoney Beach Rural Telephone Company has been incorporated.

## Brantford, Ont.

The Street Railway Company have entered into a bond to carry out the double tracking and improvements, as outlined in the city's agreement, this summer.

Application is being made for a charter for an electric railway to be constructed from Delhi to Burford, touching Kelvin, Northfield and Harley, and connecting with the proposed Brantford and Woodstock radial. Several Brantford promoters are behind the application.

The City Council has passed the new power by-law authorizing an agreement with the Cataract Power Company for the supply of lighting and power to this city. A short term contract for five years was passed. Under the new agreement the company furnishes street lighting at \$48 per arc light per annum for 250 lights, a reduction of \$7 per light on former figures; also domestic and incandescent lighting at 7.65 cents per kilowatt, instead of 9 and 10 cents as formerly charged. These prices, according to members of last year's Power Committee, do not touch the figures offered by the Hydro-Electric, had that source of electric energy been taken by the city. The Hydro-Electric figures were \$37 per arc light per annum and 5 cents per kilowatt for incandescent lighting, from which the city would have derived a good surplus revenue. The new agreement includes the terms, however, that power and light will be supplied to this city at prices 10 per cent. less than charged by any municipality for Hydro-Electric power, due allowance being made for transmission.

## Calgary, Alta.

A vote will be taken on April 2nd to issue \$144,000 four and one-half per cent. 30 year debentures for electric plant, system and power.

The Calgary Power & Transmission Company have engaged Cecil B. Smith, consulting engineer, Toronto, to report on their power proposition at Horseshoe Falls on the Bow. Mr. Smith states that this fall alone will produce at least 8,000 horse power.

## Cumberland, B.C.

The British Columbia Telephone Company will install a system here.

## Chatham, N.B.

Tenders closed recently with R. A. Logie for the purchase of \$25,000 town electric light debentures.

## Carieville, Sask.

A local telephone joint stock company has been formed at this place.

## Chatham, Ont.

Important extensions to the northern and southern ends of the Chatham, Wallaceburg, and Lake Erie Electric Road are announced, subject to the decision of the American financiers who are interested in the proposition. The towns of Blenheim and Ridgetown on the south and Petrolia and Sarnia on the north will be tapped this summer.

## Fraserville, Que.

The citizens are considering the question of remodelling the municipal electric light plant, and propose to install two water wheels and dynamos, with a total rating of 450 kw., with switchboard. M. Deschênes is secretary and treasurer.

## Gravenhurst, Ont.

The bylaw to raise \$15,000 for the purpose of completing the expenditure undertaken in the construction of the Hydro-Electric power plant at South Falls, has been approved by the ratepayers.

## Guelph, Ont.

The financial report of the Light and Heat Department shows a net profit for the year of \$34,179.64. The present prices for gas are \$1 net, and for electric light 10 cents per kw.

Tenders have been received by N. Tessier, Secretary, Department of Public Works, Ottawa, for electric fixtures for the armory. Plans and specifications may be seen at the office of W. Mahoney, architect, Clerk of Works, Guelph, and at the Department of Public Works, Ottawa.

## Galt, Ont.

Engineer Hillman, of the Patterson Railway Company, Hamilton, is in the town arranging for the survey for the proposed Galt-Hamilton electric road.

## Grimsby, Ont.

This village is about to take over the electric lighting system from the company which has heretofore operated it.

## Havelock, Ont.

The Village Council recently passed a resolution recommending the Legislature to grant a charter for the construction of an electric line between Port Hope, Cobourg and Havelock.

## Hamilton, Ont.

The City Council has decided not to carry out its contract for power with the Cataract Power Company, but to submit the question again to the ratepayers.

Plans are being made for the proposed re-arrangement of arc lamps, under the new contract beginning July 1, 1909. The new plans call for 730 lamps. The present system includes 242 electric arc lamps and 279 gas lamps. Under the new contract the gas lamps will be discarded.

The Wentworth, Ont., County Council

object to the Hydro-Electric Commission erecting towers in the county in the way it is proposed, and a resolution has been passed unanimously to petition the Ontario Legislature to grant no privileges to the Commission to erect towers or poles on the highways of the county.

## Kamloops, B.C.

The City Council contemplate an expenditure of \$16,500—\$9,000 to purchase a compound direct connected 150 kw. engine, \$3,200 for a 150 kw. dynamo, \$2,100 for a new 150 h.p. boiler, new wiring \$2,200, contingencies \$1,000. H. K. Dutcher is their consulting engineer.

## London, Ont.

Mr. Justice Riddell lately heard evidence in the case of Smith vs. the City of London, which is the first application for a motion of injunction setting aside a municipal contract with the Hydro-Electric Power Commission.

The London Electric Company places the price at which it will sell out to the city at \$506,000.

Plans and estimates are being prepared by Electrical Engineer Sifton in regard to Niagara power. Two estimates will be submitted, one on the cost of duplicating the present electric plant, and the other on the cost of a plant to distribute 5,000 horse-power, as outlined in his previous estimate to the committee when he named that amount as the probable sale at \$35 per horse-power or less.

## Listowel, Ont.

Tenders have been received by A. St. George Hawkins, Chairman of the Fire, Water and Light Committee, for the equipment of the municipal electric system of Listowel. The plant will include steam driven generators and both commercial and street lighting. It is proposed to install over 250 Tungsten lamps on the streets. C. H. and P. H. Mitchell, Toronto, are the consulting engineers for the town.

## Midland, Ont.

The Simcoe Electric Railway & Power Company are applying for incorporation to construct an electric railway from Midland to Coldwater, Ont., also for power to issue bonds to the extent of \$20,000 per mile.

## Moncton, N.B.

The Acadia Telephone Company are applying for incorporation to construct and operate a telephone system in Kent and Northumberland counties. A. A. Richard, J. T. Lambert, Rev. J. Dufour and others are interested.

## Moulton Township, Ont.

The ratepayers will vote March 30th on a by-law to issue \$5,000 five per cent. 20 year debentures as a bonus to the Dunnville, Wellandport & Beamsville Railway. Walter M. Allen, Clerk.

## Moyie, B.C.

The Kootenay Telephone Lines, Limited, have recently extended their lines north to Wasa and south to Elkmouth and Waldo, and to other points near the international boundary at Gateway. They have also provided a long distance connection with the local system at Moyie. They have now obtained a charter for the construction of a local system at Fernie. This system is rapidly being pushed to completion.



The company also intends to put its subscribers in long distance communication with all eastern points served by the Alberta Government system. The chief part of the company's expenditure in the near future will be in putting in a copper metallic circuit, consisting throughout of two copper wires of 10 gauge. This line will be carried on cedar poles set 165 feet apart from Crow's Nest to Port Hill, Idaho. The Alberta system will be connected with this line at Crow's Nest.

#### Montreal, Que.

The deal was closed recently for the financing of the Stave Lake Power Company's project. The proposition is to develop the falls on the Stave river.

Application will be made for the incorporation of the Kapitchouan Railway Company, for the construction of an electric railway from Lake Kapitchouan to this city, with branch lines of about twelve miles in length.

A company has been organized to construct an elevated railway from the western limits of the city to the eastern limits of the town of Maisonneuve. Application for a charter is now being made.

At the annual meeting of the shareholders of the Bell Telephone Company held recently in Montreal, it was announced that negotiations were in progress between the management and the government of Saskatchewan looking to the purchase by the latter of the telephone plant of the company in that province. Representatives of the province have been in Montreal conferring with the company. The transaction is along pretty much the same lines as the purchase of the Bell lines in Manitoba by the government of that province. No figures are mentioned by Mr. Sise, the president, in making the announcement.

#### Medicine Hat, Alta.

The Southern Alberta Railway Company have obtained a charter to construct an electric railway from the main line of the C. P. R. and the Bow river to this city.

#### North Vancouver, B.C.

The B. C. Electric Railway Company have decided to rebuild their transmission lines, carrying them up Lynn creek. New transformers will be installed in the substation and also a new transformer giving double power to the street lighting system. Mr. A. G. Parry is local manager of the company.

#### Nelson, B.C.

The City Council have accepted the offer of the Electric Tramway Company to buy out the plant at the sum of \$10,000. No cars have been in operation since the car barns and rolling stock were destroyed by fire last May.

#### New Westminster, B.C.

A. O. Hall, C.E., is making a report on the proposed dam for the Vancouver Power Company. If the Provincial Government sanction the erection of the dam it will be constructed this year.

The British Columbia Electric Railway will soon be under way with the laying of steel for the Cloverdale branch of the new Chilliwack line. The company has let the tenders for getting out of the necessary poles to support the trolley wires. The work of raising the poles and stringing the wires will be done by the electric force of the company and will easily be completed by the time the rails are laid. Two months is the lowest estimate of time for the completion of the Cloverdale branch. The pressure of work

at the car shops in the city was so great that the company found it necessary to place the order for the cars for this branch with an eastern firm.

#### Niagara Falls, Ont.

At a recent meeting of the City Council the Bell Telephone Company was granted a renewal of its exclusive franchise to operate in this city for five years. The city is to receive 30 free telephones, and to have the use of the company's poles for its fire alarm system.

W. D'Arcy Ryan, illuminating expert, with his first assistant, G. H. Stickney, have completed the survey for the permanent lighting of the Falls. Large projectors will be used, producing more than two billion candle power. Three batteries will be installed. The principal one will be at the transmission house of the Ontario Power Company, on the upper river bank. Another will be opposite Goat Island, and the third at the spillway of the Ontario Power Company. Installation alone will cost in the neighborhood of \$150,000. The plant will be installed early in the spring.

#### Ottawa, Ont.

The Hill Electric Switch Company, Limited, of Montreal, are supplying the switchboard and panel boards for the new Y. M. C. A. building in Ottawa.

Application will be made to the Dominion Government for the incorporation of the Arnprior and Pontiac Railway Company. Perkins, Fraser & Gibson are solicitors for the company.

#### Oshawa, Ont.

Tenders have been received for the entire stock, save certain shares, of the Oshawa Electric Light Company, Limited. This company owns its own steam generating plant and water power in the town of Oshawa. This company also owns the property and assets of the Bowmanville Electric Light Company, Limited, having steam and water power generating plant and transmission system in the town of Bowmanville. Address E. R. C. Clarkson, 33 Scott street, Toronto, for full information.

#### Orangeville, Ont.

Tenders will be received shortly by Smith, Kerry & Chace, consulting engineers, Confederation Life Building, Toronto, for the construction of the power house for the Dufferin Light & Power Company. The power house will contain three 150 k.w. hydraulic units with step-up transformers to a transmission voltage of 22,000 volts.

#### Oakville, Ont.

Oakville's new municipal electric light plant is now in operation. Lights have been strung in the centre of the streets, and the town is well lighted. The power is brought over the Hamilton Cataract Power Company's line from Decew Falls. The waterworks system is about complete, the electric pumps are being installed, and the water is expected to be ready for use shortly.

#### Prince Albert, Sask.

The city is advertising for an engineer holding a second-class Saskatchewan certificate to operate the electric plant. Salary \$80 a month.

#### Port Arthur, Ont.

Tenders closed March 10th for the supply and delivery of the following material f.o.b. Port Arthur: 2,000 pounds 5 1-2 by 9-16 spikes; 700 pounds 3 1-2 by 3-4 track bolts (square nuts); 60 tons 60-pound standard T rails. J. McTeigue, Secretary, E.R.L. & T. Commissoiners.

The Government has started to get matters into shape for the erection of the

dams at Dog Lake, Port Arthur. To this end, H. G. Acres, hydraulic engineer for the Hydro-Electric Commission, is making the necessary concluding surveys preparatory to starting the work, A. L. Russell, who already has done the preliminary work and furnished the Commission with plans and detailed information with respect to the lake, river and grounds surrounding, accompanies Mr. Acres and participates in the work being done. In addition to building the dam, the outlet of the lake will be lowered, by blasting out the channel to a depth of some three feet, thus enabling the drawing off of considerably more water. We understand that instructions have been given to have the necessary roads cut out for taking in supplies to the site of the work.

#### Peterborough, Ont.

The ratepayers will shortly be called upon to vote on a by-law to raise \$15,000 to construct foundations, forebays, wheel-pits, tail race, and power house to develop power at the new water works dam. Everything will be prepared for the installation of the machinery which will be purchased at a later date. At present Peterborough pays \$9,000 each year for street lighting.

#### Toronto, Ont.

#### St. John, N.B.

The Fundy Tidal Power Company are applying to the Dominion Government for incorporation, with power to develop power from the tidal flow of certain waters emptying into the Bay of Fundy, and for this purpose to construct dams at certain points; also to carry on the business of a power and electric heating and lighting company, etc.

The chief matter before the New Brunswick Union of Municipalities, in annual session here recently, was the telephone business. After a long discussion it was decided, practically unanimously, to memorialize the New Brunswick Legislature to take over the New Brunswick telephone system.

#### Stellarton, N.S.

The Edgerton Tramway Company, Limited, of Stellarton, have purchased the electric plant of the New Glasgow Electric Company, Limited. It is proposed to move the plant from New Glasgow to the former company's buildings at Stellarton, and to add new machinery to such an extent as to make the complete plant up-to-date in every way.

#### St. Louis de Mile End, Que.

Tenders closed recently for wiring the ground floor of the local post office.

#### Swift Current, Sask.

The citizens have voted in favor of the by-law granting F. Laidley a 10-year franchise to install an electric light and gas plant.

#### Sydney, N.S.

Antoine A. Richard, McLeod's Mills; J. Telesphore Lambert, St. Ignace; Rev. J. Emery Dufour, Acadieville; Mrs. Lucie Richard, McLeod's Mills; and Jacques B. Goguen, Acadieville, Kent County, are applying for incorporation as the Acadia Telephone Company, to construct and operate a telephone system in Kent and Northumberland counties.

#### Toronto, Ont.

Tenders for underground cable required by the city will be received until April 30th.

A telephone system will be built by the Hydro-Electric Commission along the public highway, paralleling the course of the power transmission line and with points



at every mile where connections may be made.

The bill to incorporate the Eastern Ontario County Electric Belt Line Company, capitalized at \$1,000,000, is now before the Provincial Government. The company proposes to build an electric line from Lancaster township, running along the St. Lawrence to Cornwall, thence to Brockville, thence northwesterly through to Dundas and Lanark to Darling township, passing through Athens, Lanark, Perth, and connecting with the Lanark Counties Electric Railway Company, and from Morrisburg through Dundas, Russell and Carleton.

The Toronto Electric Light Company have raised their distribution voltage to 240-480.

City Electrical Engineer Aitken is preparing the specifications for the municipal electric plant, with a view to advertising for tenders in the near future.

#### Trenton, Ont.

This town is making application to the provincial legislature for authority to issue debentures up to \$200,000 in aid of the development of power on the river Trent.

#### Tillsonburg, Ont.

Application is being made for the incorporation of the Tillsonburg & Southern Counties Electric Railway.

#### Tillbury, Ont.

A new telephone company is being organized by the farmers of Tilbury East. The president is E. Foxton. The directors include J. N. Halliday, H. S. Lloyd, C. Armstrong, L. Brown, P. W. Ritchards, J. Phillips and D. W. Kett.

#### Vernon, B.C.

Mr. J. C. Kennedy, engineer-in-charge of the Slave Lake Power Company, Vancouver, recently visited Okanagan for the purpose of going over the site of the Co-teau Power Company, and to verify the plans of their engineer, Mr. A. E. Ashcroft. Mr. Kennedy says that arrangements may safely be made for the development of 5,000 horse power required to operate a system of tramways in this district.

#### Vancouver, B.C.

The British Columbia Electric Railway Company recently made a public test of three automatic tram fenders. The types tested were the Watson, which is now used in Toronto, one manufactured by Messrs. McLeod & Young, of the British Columbia Electric Railway Company, and the other the invention of Mr. Byers, of Vancouver. All the fenders operated satisfactorily. No action will be taken at present in selecting a fender.

City Electrician McCulloch has completed specifications upon which tenders will shortly be called for a police signal patrol system.

C. F. Pretty has purchased the timber tract holdings of the Canadian Industrial Company, on the east coast of Vancouver, and proposes to install a power plant, pulp and saw mills.

J. D. Schuyler, engineer for the British Columbia Electric Railroad, estimates that they will be delivering power from their Coquitlam Lake plant sometime in July.

Mr. Wm. Whyte, second vice-president of the C. P. R., is reported to have said that the C. P. R. will eventually electrify its lines in the west and a commencement may soon be made in the southern portion of British Columbia. For some time officials of the C. P. R. have had experts studying the streams in the mountains with a view

to determining whether enough energy could be developed through waterpower to supply electric power. They reported that from the Rocky Mountains to the coast range the waterfall is sufficient to supply power for all the railroads in the United States.

#### Victoria, B.C.

The British Columbian Electric Railway Company have a proposal before the Victoria, B.C., City Council, agreeing to install a power plant on the Jordan river and deliver 10,000 h.p. at their city substation. The amount expended would be \$1,500,000. The company undertakes to supply the city with light for the streets at half the present prices charged by the city's own plant. They agree also to give Victoria the same rates for light and power in vogue in Vancouver. The city on its part agrees not to enter into competition with the company in furnishing light and power without either purchasing or offering to purchase the company's plant. The price is to be fixed by the city in the first instance, but if the company does not accept it, arbitrators are to determine the amount to be paid. If the company does not accept the city's offer or the award of the arbitrators, the city may install its own plant. This arrangement is to remain in force during the pendency of the company's charter, which has thirty years to run.

#### Winnipeg, Man.

Tenders addressed to M. Peterson, Secretary, Board of Control, will be received until April 2nd for supply of insulators, hardware, cross arms, cedar poles, top pins, etc., for the extension of the street lighting system. Specifications at office of City Electrician.

Tenders addressed to M. Peterson, Secretary, Board of Control, will be received until April 15th for the manufacture of two testing transformers, namely: One 30 kw. at 80,000 volts and one 200 kw. at 200,000 volts, also for control equipment therefor. Specifications and forms of tender may be obtained at the office of the Power Engineer, Carnegie Library Building, this city, or at the office of Smith, Kerry & Chace, Confederation Life Building, Toronto.

It is stated that the Canadian Northern Railway is preparing to electrify its shops here, using power from the street railway plant.

The report of the Telephone Department of the Manitoba Government was recently tabled by the Hon. Robert Rogers. The receipts from all sources from January 15th to December 31st were \$722,612. The expenditures, including uncollectable debts, were \$342,611, including \$98,699 for maintenance. The surplus is \$380,001. The balance would have been increased by about \$27,000 had the fortnight necessary to complete the year been included. No statement of policies was made.

#### Windsor, Ont.

A group of capitalists of this city are contemplating the export of a large quantity of hydro-electric power to Detroit, and other points in Michigan. The Electrical Distributing Company, which latterly secured a Dominion charter, are the parties concerned, and they are reported to be negotiating with the Ontario Government for a supply of power. The parties interested include John Davis, former mayor of Windsor, president; George M. Hendry, vice-president, and W. C. Kennedy, manager of the Windsor Gas Company, is secretary.

#### AWARDED.

##### Calgary, Alta.

The City Commissioners have awarded a contract for four modern street railway cars at \$4,875 each, to the Car & Coach Company, Preston, Ont. The Ottawa Car Company obtained a contract for eight of a similar type at the same price.

The City Commissioners have awarded the contract for the steel poles required for the street railway to the Standard Supply Company at \$32.50 each for 28-foot poles. The optional price was \$41 each for poles of 30 feet in height.

The City Council has recently ordered from the Robb Engineering Company, Amherst, N.S., one 750 kw. Robb-Armstrong engine of the vertical enclosed high speed type, three crank, compound, for direct connection to a 500 kw. electrical generator.

Contracts for the street railway system amounting to more than \$100,000, have been awarded by the City Commissioners as follows: Allis-Chalmers-Bullock Company, motor generator set and switchboard, \$15,950, installed in the power plant. Their nearest competitor was the Fairbanks Company, who bid \$6,150, for the generator set alone, but did not tender on the switchboard. The Allis-Chalmers-Bullock tender on the generator set was \$6,085. Seven hundred and fifty horse power engine, Robb Engineering Company, Amherst, N. S., \$14,300. The Belliss-Morecom Company were next with a triple expansion engine with the same power at about the same price. The 1,100 tons of steel rails, 400 tons of which will be 80 pounds to the yard, and 710 tons 60 pounds, Gorman, Clancey and Grindley, Calgary, who represent a steel manufacturing firm with headquarters in Lorain, Ohio. The amount involved reaches the total of \$70,000, the price being \$61.54 per ton. The 80-pound rail will be used on paved streets and the lighter steel on the unpaved streets. The East Kootenay Lumber Company will supply the necessary ties at the rate of 56 cents each. Pugh & Livingston, of Okotoks, Alta., also tendered for ties.

##### Edmonton, Alta.

This city has recently ordered from the Robb Engineering Company, Amherst, two 600 h.p. Robb-Armstrong engines of the vertical enclosed high speed type for direct connection to electrical generators.

The Crocker-Wheeler Company, Ampere, N.J., have received orders for two 400 k.w., 575 volt engine-driven railway generators for this city.

Contracts have been awarded by the Street Railway Company, as follows: Federal Electric Company, Montreal, Que., aluminium, contract price, \$4,500. The nearest competitor was the Northwest Electric Company, of Edmonton, whose price was \$50 lower. The Northwest Electric Company will furnish the overhead specials for \$1,947.90. Wm. Stuart & Company will supply the wooden poles needed for \$3,400. Copper bonds will be supplied by the Canadian General Electric Company, Peterborough, Ont., for \$5,070.

##### Iberville, Que.

The Northern Electric and Manufacturing Company, Limited, have been awarded the contract for supplying and installing a western electric alternator, exciter and switchboard equipment for this town.

##### Montreal, Que.

The G. T. R. have received an order from the Southern Counties Railway Company for the construction of six electric train cars, for use on the service across Victoria bridge.



**Moncton, N.B.**

The Canadian General Electric Company, Toronto, have been awarded the contract for electrical supplies for the city. The contract for cross-arms was given to the Paul Lee Company, Limited, and the tender of The Sumner Company for cedar poles was accepted.

**St. John, N.B.**

The contract for the construction work involved in the hydro electric development of the Grand Falls Power Company on the St. John river at Grand Falls, has been awarded to the Frank B. Gilbreth Company, of New York. John J. McRae, of Ottawa, Ont., is the chief engineer, and Ralph Mershon of New York, is the electrical engineer. This plant will generate 100,000 horse power in electric current, which will be furnished to the various towns throughout New Brunswick. The work involves, among other features, the construction of a number of shafts in rock excavation 130 feet deep, a power chamber 30 feet by 260 feet and 130 feet deep, and a tail race tunnel 28 feet in diameter and 2,400 feet long, a power house 350 feet long and 260 feet wide. The intake shafts will be nine in number and 12 feet in diameter, 130 feet deep. The plant will be equipped with modern hydraulic and electrical machinery for high potential and long distance transmission. Actual construction will be begun immediately and will be pushed through to completion at an early date. The estimated expenditure is in excess of \$5,000,000.

**Toronto, Ont.**

The T. Eaton Company, of Toronto, have recently ordered from the Robb Engineering Company, of Amherst, N.S., one 25 inch by 24 inch Robb-Armstrong simple Corliss engine for direct connection to a 300 kw. generator, also one 18 inch and 36 inch by 24 inch Robb-Armstrong horizontal cross compound Corliss engine for direct connection to a 300 kw. generator.

Contracts for the rewiring of the Canada Permanent Buildings have been awarded to Hudson & Lewis, of Toronto. The cost will be in the neighborhood of \$6,000. They are using the individual meter system, all meters being placed on a panel board in the basement and directly connected to the various offices.

Between \$500 and \$600 is being expended in standardizing some of the electrical equipment at Upper Canada College. The Toronto Electric Light Company have the contract.

The contracts for the electrical equipment of twelve of the stations on the transmission line between Toronto and Niagara Falls and St. Thomas have been awarded. Two-thirds of the equipment has been awarded to the Canadian General Electric Company and about one-third to the Canadian Westinghouse Company. This installation will provide for the supply of power to the following municipalities:—Niagara Falls, Dundas, Hamilton, Toronto, Weston, Brampton, Acton, Milton, Brantford, Paris, St. Mary's, Woodstock, Ingersoll, Norwich, Guelph, Preston, Hespeler, Galt, Berlin, Waterloo, Elmira, New Hamburg, Baden, Stratford, Tillsonburg, London, St. Thomas. In the new equipment is included a modern protective system, the first to be introduced on this continent. The equipment also provides a spare transformer for each station, and even with these additions the cost of the equipment will be some \$350,000 below the estimated cost. Mr. McGuigan's tender for building the transmission line is \$1,270,000, so that it will be found when the new system is completed that the commission has

been well within the mark in all its estimates.

**Vancouver, B.C.**

The British Columbia Telephone Company have awarded to the British Insulated and Helsby Cables, Limited, a large contract for paper insulated air space telephone cables. This is in addition to the contract obtained last fall for 1909 delivery.

**Winnipeg, Man.**

The telephone commissioners have awarded to the Manitoba Cedar Company a contract for 50,000 poles.

The tender of the Lock Insulator Manufacturing Company of Victor, N.Y., has been accepted for supplying insulators for the power transmission line at \$2.53 each, making a total of \$14,625.

The Northern Electric and Manufacturing Company have been awarded the contract for a pump and motor for well No. 7, at \$11,000.

At a recent meeting of the Board of Control, Cecil B. Smith, the chief engineer in charge of the power plant construction, appeared with W. G. Chace, the resident engineer, before the board in regard to the tenders received for the construction of a transmission line from Point du Bois, and a telephone line and equipment for a repair shop. A motion was passed in favor of accepting the tender of the Williamson Construction Company and H. D. Williamson, of Toronto, at a lump sum, partly on an estimate basis, of \$118,424. Of this sum, \$83,424 is the estimate for steel, gravel, cement, etc., in the construction of towers. The motion also included a recommendation for the acceptance of the tenders of R. & D. McLeod for the construction of the telephone line. The McLeod Company's estimate was \$23,421. The tender of the Stuart Machinery Company, at \$1,544, for repair shop equipment was recommended for acceptance.

**A. I. E. E. CONVENTION.**

The next annual convention of the American Institute of Electrical Engineers will be held during the week beginning June 28, 1909, at Hotel Frontenac, Thousand Islands, Frontenac, N.Y.

Mr. Lewis, M.P., has a bill before the House which necessitates that every sea-going and coasting passenger ship over four hundred tons gross tonnage, registered in Canada, and every sea-going and coasting freight ship over twelve hundred tons gross tonnage, registered in Canada, shall be equipped with an apparatus for wireless telegraphy, under penalty of imprisonment or fine.

Mr. Smith, M.P. (Nanaimo), has introduced an amendment to the Railway Act adding the following subsection:

"2. No operator, train despatcher, or other employee who, by the use of the telegraph, telephone, or other electrical device, despatches, reports, transmits, receives, or delivers orders or messages pertaining to or affecting train movements shall be required or permitted to be on duty for a longer period than eight hours in any twenty-four hour period, except in case of emergency, in which case any such employee may remain on duty for a period not exceeding twelve hours in a twenty-four hour period, and such excess duty shall not be permitted on more than two days in any seven. The eight hours herein mentioned shall constitute a day's work, and shall not be in broken periods, but shall be one continuous period, with the exception of one hour which may be allowed for meals."

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One Warren Generator, 150 K. W. single phase, 133 cycles, 2200 volts, 800 speed, complete with Exciter and Switchboard; only in use one year. For further information apply to

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### Meetings and Conventions

Canadian Electrical Association annual convention at Quebec, June 16th, 17th, 18th, 1909.

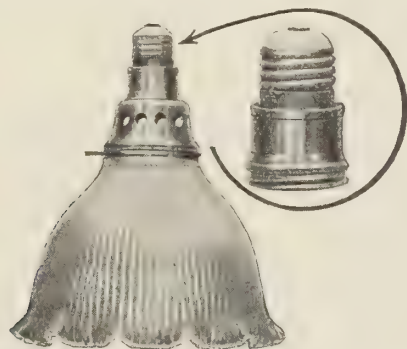
Nova Scotia Society of Engineers, April 8th, at Halifax, N.S.

Canadian Railway Club, April 6th, Windsor Hall, Montreal.

The next annual meeting of the Canadian Manufacturers' Association will be held in Hamilton on Sept 14th, 15th and 16th, 1909.

### Socket Extension

The Benjamin Electric Manufacturing Company, 64 York street, Toronto, are placing upon the market a new device in the form of a socket extension which



offers a convenient means for attaching glassware where the outlets do not otherwise permit it. The accompanying illustration shows the device in position. This device is specially useful in connection with porcelain receptacles and flush sockets, where no provision is made for

attaching glassware. It increases the length of the socket about one and a quarter inches.

### MOONLIGHT SCHEDULE FOR APRIL.

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Apr. 1	2 40	Apr. 1	5 00	2 20
2	3 00	2	5 00	2 00
3	No Light	3	No Light	
4	" "	4	" "	
5	" "	5	" "	
6	7 00	6	9 00	2 00
7	7 00	7	10 00	3 00
8	7 00	8	11 00	4 00
9	7 00	10	0 00	5 00
10	7 00	11	1 00	6 00
11	7 00	12	2 00	7 00
12	7 00	13	3 00	8 00
13	7 00	14	3 50	8 50
14	7 00	15	4 30	9 30
15	7 00	16	4 40	9 40
16	7 10	17	4 40	9 30
17	7 10	18	4 40	9 30
18	7 10	19	4 40	9 30
19	7 10	20	4 30	9 20
20	7 10	21	4 30	9 20
21	7 10	22	4 30	9 20
22	7 10	23	4 30	9 20
23	7 10	24	4 30	9 20
24	10 30	25	4 30	6 00
25	11 20	26	4 30	5 10
27	0 10	27	4 20	4 10
28	0 40	28	4 20	3 40
29	1 10	29	4 20	3 10
30	1 40	30	4 20	2 40

Total.....167 20

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### Brushes for D. C. Turbo-Generators

The Morgan Crucible Company, Limited, Battersea Works, London, S.W., have issued a pamphlet upon "Morgan's Pneumatic Brush Gear and Morganite Brushes for D. C. Turbo-Generators," for which Mr. J. F. B. Vandeleur, 3 Dineen Building, Toronto, is the Canadian representative. The pamphlet, which is a reproduction of an article which was recently published in "The Electrician," is concise and well illustrated and gives an excellent idea of the splendid design and construction of these generators. After a great many experiments with various types of brush gear for direct current turbo-generators, which gave unsatisfactory results with spring brush holders, the company decided upon making radical departures from existing practice. Tests were accordingly made with a pneumatic type of

gear. These were so encouraging that patents were taken out for collecting gear based on this principal. The design of this has passed through various changes and has been embodied in an extremely simple apparatus. The development of this gear is interestingly explained in the pamphlet referred to.

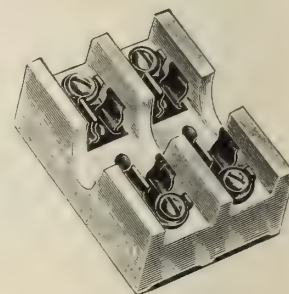
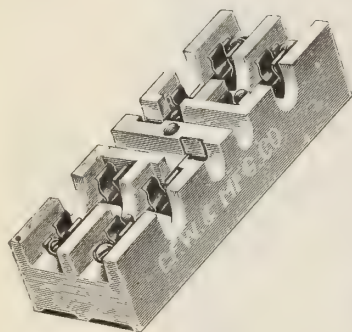
### Johannesburg, S. A., Power Plant

Messrs. Laurie & Lamb, of Montreal, Canadian agents of Belliss & Morcom Limited, Birmingham, Eng., report that the Johannesburg, S.A., power plant has been equipped with six Belliss & Morcom engines, of standard three-crank triple expansion type, with high, intermediate and low pressure cylinders, with working cranks at equal angles. There are three 1,000 K.W. sets and three 500 K.W. sets.

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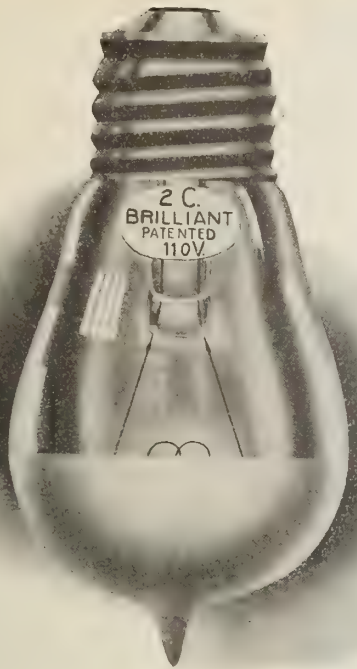
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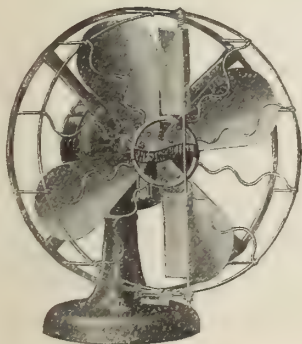
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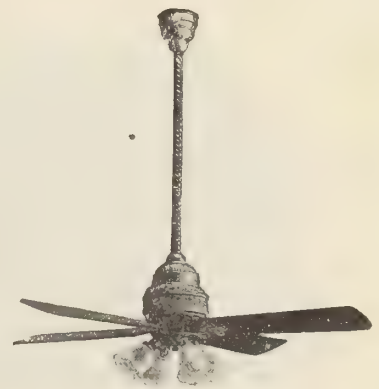
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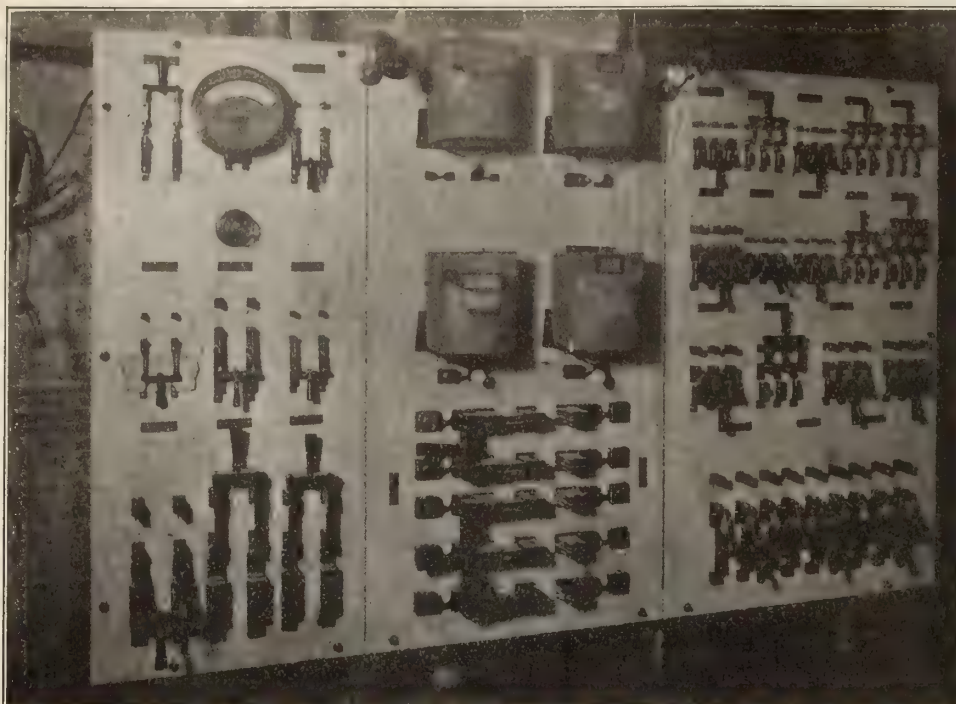
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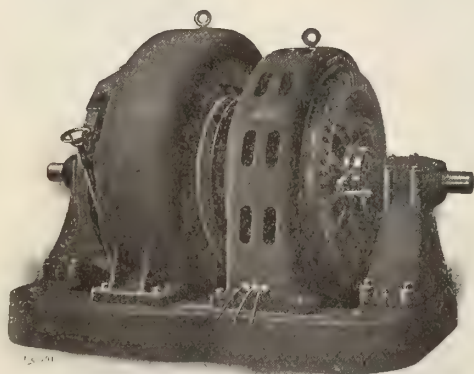
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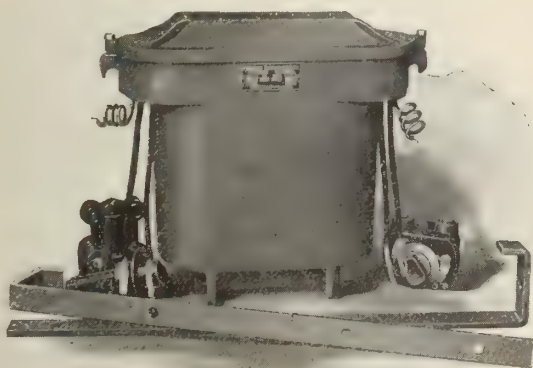
London Branch—Audrey House, Ely Place, Holborn  
Paris, France—E. H. Cadiot, 12 Rue St. Georges  
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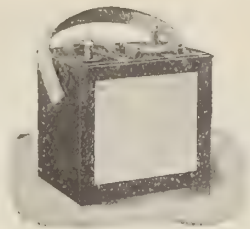
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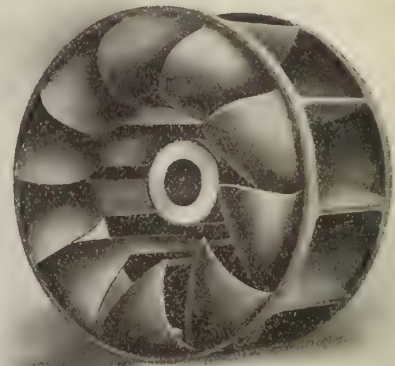
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Established 1867  
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The "I-Comfort" System of Indirect Illumination  
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Room 12 x 14 feet, beautifully illuminated with a one-unit fixture containing one 60 watt Tungsten Lamp—consuming current about equal to one 16 c.p. carbon filament lamp.

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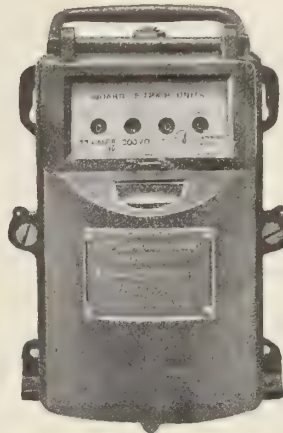
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The Ferranti Meter is guaranteed to save you 75% of your meter troubles.

It will run on a load of 5 watts, and is built to last a life time.

Send for Catalogue and Sample Meter before purchasing.

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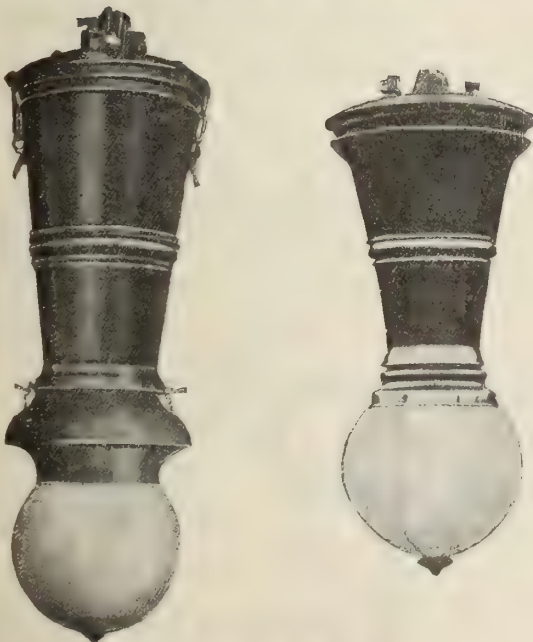
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Tel. Main 540. Cable Address, Trolley, Toronto

**Brantford and Hamilton With-**  
**draw from Hydro-Electric**

Brantford and Hamilton having decided to withdraw from their contract with the Hydro-Electric Power Commission, a bill has been presented at the House and given its first reading whereby these two cities are dropped and the names of Stratford and Ingersoll added. The bill further states that all pending actions regarding the validity of corporations contracting with the Commission are stayed. Ingersoll asks for 500 h.p., and are to pay at the rate of \$24 per h.p. It is estimated that it will cost \$69,485 to build their plant and furnish the transmission lines, \$3,270 being the estimate for depreciation and repairs. Stratford wants an even 1,000 h.p. and it will cost them \$27.10 per h.p. by the Hydro-Electric figuring. Their construction work is estimated at \$173,580, with \$8,120 for maintenance and operation.

**Telephones in Toronto**  
**and Montreal**

Toronto has again stolen a march on Montreal, and is able to give an instance of more rapid growth than the old metropolis. The official figures of the Bell Telephone Company, just out, show that for the first time in the history of the company Toronto has more telephones than Montreal. Up to the present time, Montreal had always led Toronto by quite a substantial majority, but the recent financial depression seems to have struck Montreal more seriously than it did Toronto, because the results show that during the past year, a great many more new subscribers were secured in the Queen City than in the older city down on the St. Lawrence. The official figures show that Toronto has a little over 24,100 telephones in use, while Montreal is a little over a 100 behind. In addition, the official reports show that the average number of calls per telephone is very much larger in Toronto than in Montreal.

**Miscellaneous Notes**

The Eastview Telephone Company, Limited, Eastview, Sask., has dissolved.

The temporary power house at Pointe Aux Trembles for the Saraguay Electric & Water Company has been completed and the plant was put in operation on February 13th.

The Maquam Timber and Power Company, Limited, has been incorporated at Victoria, B.C., with a capital of \$100,000 to acquire water records for power for milling and other purposes.

The British Insulated and Helsby Cables, Limited, of Montreal, have recently been awarded the contract for the installation of over seven miles of extra high tension cable on the lines of the Montreal Light, Heat & Power Company.

Orillia's electric light charges have been reduced to the following schedule: Commercial, hotel and office lights, 22 cents per month net per 16 c. p.; domestic lights, 18 cents net per 16 c. p.; Nernst lamps, 33 cents per glower; arc lamps as ten 16 c. p. lamps; Tungsten lamps, 40 watts and under as one 16 c. p. over 40 watts in proportionate units. All subscribers for four lights and over to be allowed current for one outside light free, subject to installation and maintenance by subscriber, and to be kept burning all night. Business signs to be charged for candle power lamps used, net.

**Electric Repair &**  
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**Electric Apparatus**  
**of all kinds Repaired**

Special Attention to Electric Elevators, Electric Power and Generator Installations.

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**Will Outlast All Other Kinds**

Get our Prices. We can fill all sized orders from our own stock. **150,000 ON HAND**  
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are our Specialties

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**TORONTO**



## Cedar Poles

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The strongest, straightest and soundest pole that grows in the "WORLD."

We can ship them East as far as Quebec and compete with Eastern poles-40 ft. and longer.

**In Ontario** we can compete only on 35 ft. poles and longer.

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Don't be afraid of them. They are the leading pole for City and Power line construction.

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Room 121

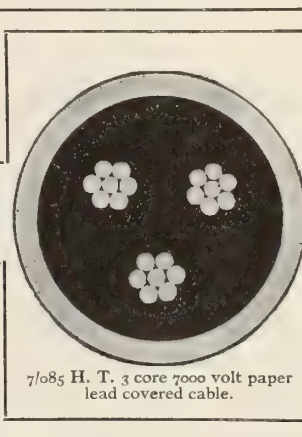
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Fully guaranteed and sold on merit.

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**Electrical Conductors**

FOR

**Railway Feeders and Transmission Lines**

**Ingot, Sheets, Wire,  
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Our type "A" electric letters are the VERY LATEST AND BEST IN THE ART. Type "A" signs on an average

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Yet the signs have BLAZING COMPELLING BRILLIANCY. They are VERY LEGIBLE and BEAUTIFUL day or night. They bring you SATISFIED CUSTOMERS.

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are the best for Central Stations to use. They are used more in one week than the ordinary grooved letter sign is used in a month, and the universal satisfaction they give tends to lead to further use of electricity. We invite investigation and are pleased to meet customers or answer questions by mail.

We want you for your benefit as well as ours to look into the merits of our one light Electric Sign as an advertising medium and then compare results. Drop us a line to-day and let us tell you all about this sign.

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16 DEGREES 6B to 8H

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## The Specialists in the Cure of Electrical Diseases

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Water and Light Commission.

Collingwood, Ont. Mar., 18 1909.

The Electrical Maintenance & Repairs Co.,  
Toronto.

Gentlemen,-

In answer to your favor of the 8th inst. re repairs to 100 K. W. Royal Alternator last December. As you know the burnout on this machine happened at a very bad time, possibly the worst in the year, with the holiday season coming on made it necessary to have the repairs completed in the shortest possible time. Your offer to completely re-wind the machine within seven working days and return to us, was fulfilled to the letter. The machine has been in operation daily since, and is reported to be giving good satisfaction.

The prompt and efficient manner in which you performed this work was very much appreciated by our Commission, and will certainly be remembered when we have any further work of the kind to do.

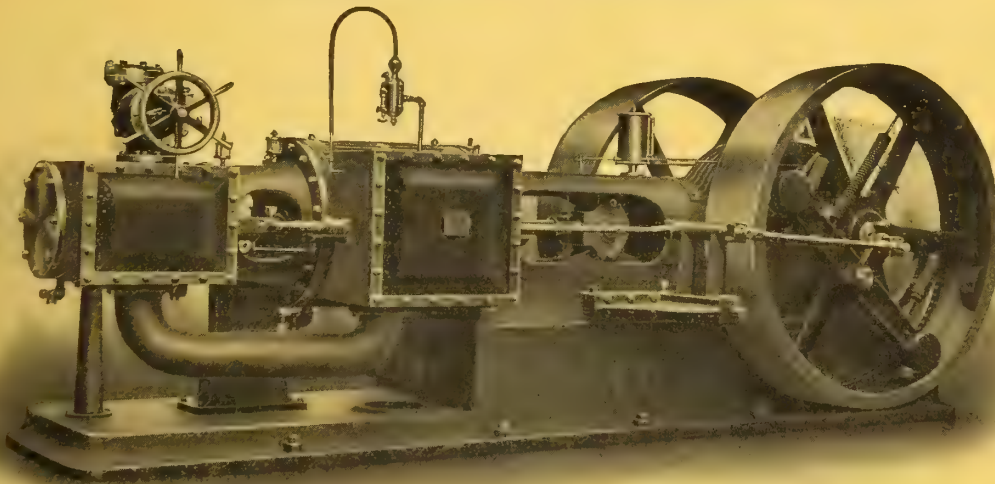
Yours truly,



Chairman Water and Light Commission.

**THE ELECTRICAL MAINTENANCE & REPAIRS COMPANY**  
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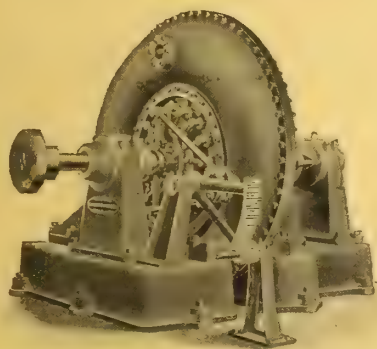
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## & Engineering Journal

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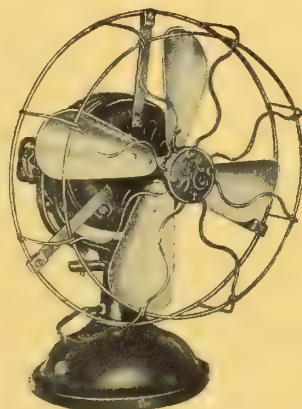
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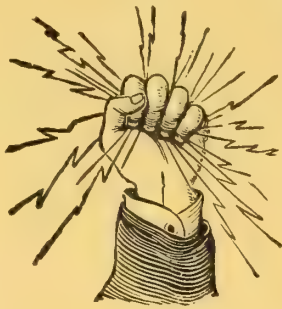
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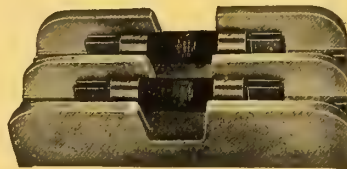


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OF ALL KINDS



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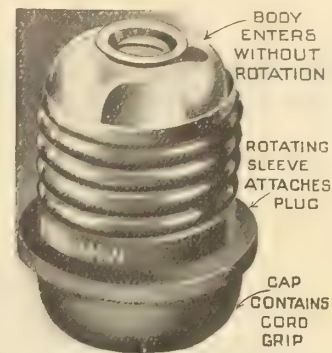
**Boston, Mass.**



# Benjamin Attachment Plug

for use with

**Fans, Vibrators, Curling Irons,  
Sweepers, Washers, Flat Irons, etc.**



Cat.  
No.  
903

## The Fan Season will soon be upon us

Next to the fan itself, the most important item is a practical attachment plug. Benjamin's revolutionary Attachment Plug is unequalled by any other for size, weight, security against breakage, neatness of appearance, and the ease with which it is attached.

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## "DIAMOND H"

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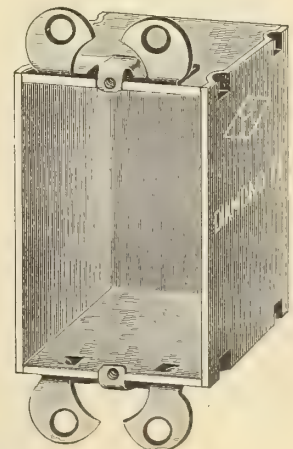
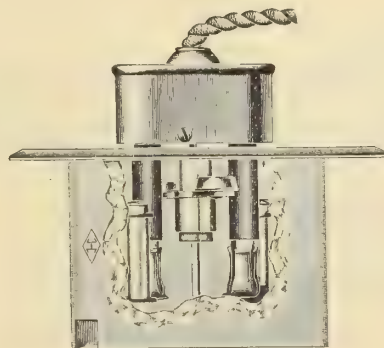
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Galvanized Steel all Cases  
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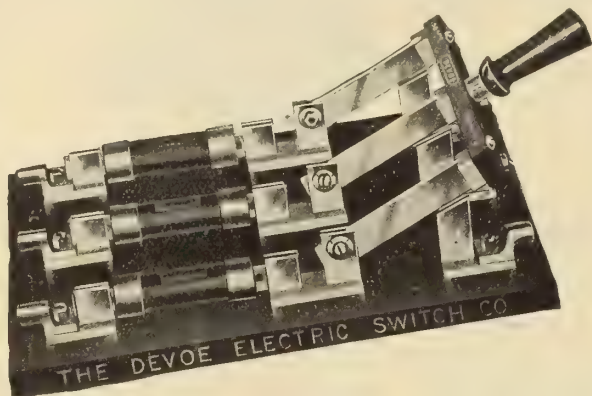
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# Panel Boards

Are you looking for the very best panel boards to be had? You simply can't go wrong by using ours.



Type "B" Switch, 250 Volts. Front connected for National Electrical Code Fuses.

We also want to quote you on that next order for switches, and switchboards. Our goods give complete satisfaction.

**The Devoe Electric Switch Co.**  
157 Craig Street West, MONTREAL

# Points

Mains from **top**  
Fuses **protect**  
the Switch.

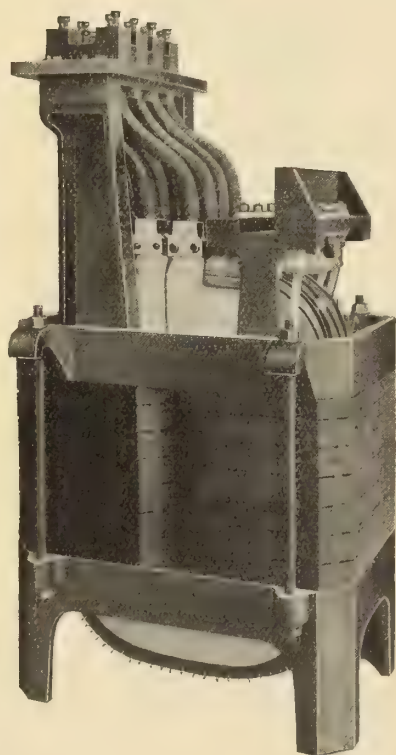
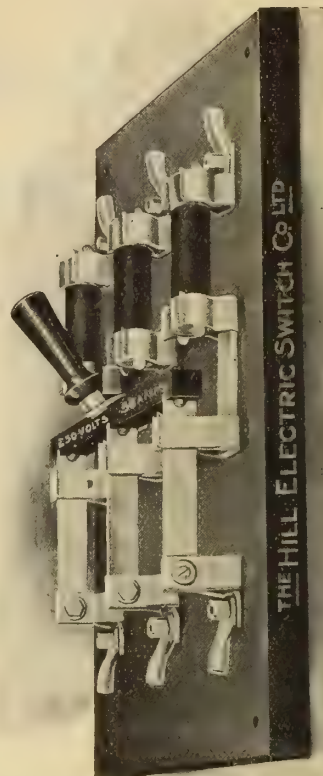
Switch **blades**  
"**dead**" when  
open.

Gravity tends  
to **open** switch.

Part of our business is to look after these points and part to fill your orders.

The

**Hill Electric Switch & Mfg. Co., Limited**  
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Special Transformers for  
Electric Reduction and  
all Power purposes.

**Polyphase Induction Motors**  
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Branch Offices:  
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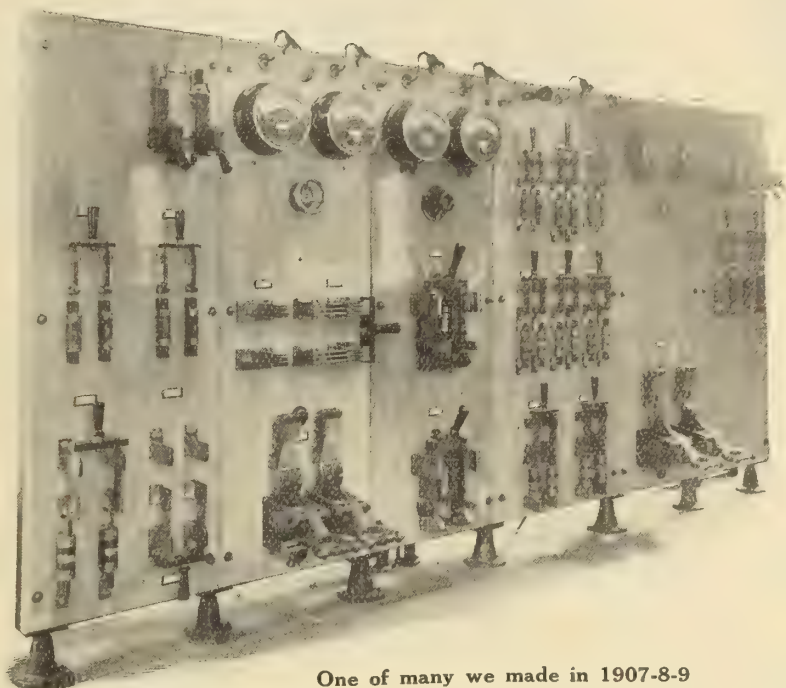
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One of many we made in 1907-8-9

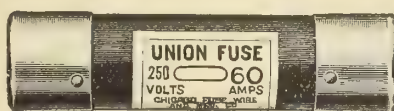
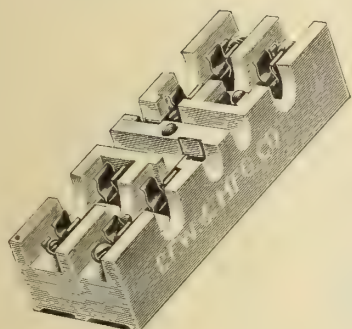
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Apparatus

Tools

Special Machinery  
designed or built to  
specifications.

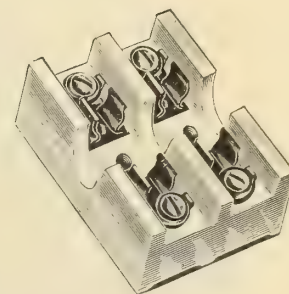
Metal  
Novelties

We solicit an op-  
portunity to quote  
on your require-  
ments.



## UNION

N. E. Code Fuses and Blocks



"Union" Enclosed Fuses

Manufactured by Chicago Fuse, Wire and Manufacturing Co., Chicago and New York

"Union" N. E. Code Blocks

No matter what your wants are in **Enclosed Fuses**, we can always  
meet the demand in **Amperes, Voltage and Current Capacity.**

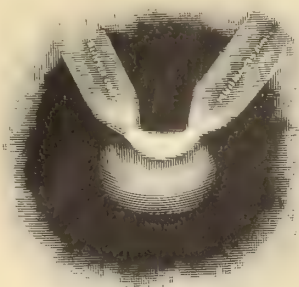
### FUSE MANUFACTURERS FOR TWENTY YEARS

**Union Fuses and Cut Outs** are used by all the largest Power and  
Railway Companies in the United States.

EVERY FUSE GURANTEED

Write for Catalogue

For Sale by **Central Electric & School Supply Co.**  
36 Adelaide Street West TORONTO



# Here We Are!

with our famous

## "Fabius Henrion" Carbons

(MADE IN FRANCE)

and owing to improved factory conditions

### NOW BETTER THAN EVER

We do **Not** know of **Trust Methods** and do **Not** ask for **Trust Prices**.  
We offer **Straight Carbons** to the **Straight Canadian People**.  
Let us prove that we can **Save You 30 per cent.** on your **Carbon Costs**.

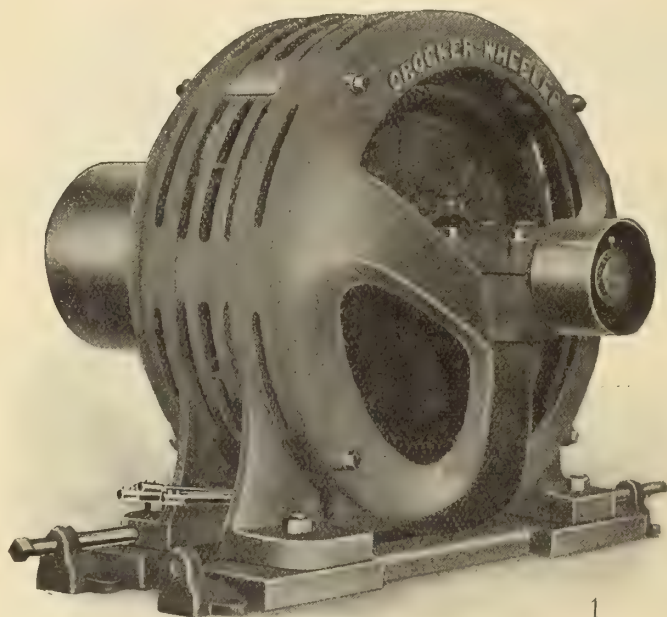
Free Samples of Carbons for Enclosed Arc Lamps, Flame Carbons, D. C. or  
A. C. yellow or white, Moving Picture Carbons.

Prompt Shipments from Large Stock

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Every Carbon Bears the Name "FABIUS HENRION" — That's Enough.



## Belted Alternators

are only one of  
the many types  
of Electrical  
Apparatus with  
which we can  
furnish you.

## Canadian Crocker-Wheeler Co.

Limited

MANUFACTURERS AND ELECTRICAL ENGINEERS

Head Office: 41 Street Railway Chambers, MONTREAL





TRADE MARK  
Reg. U. S. Patent Office

THE STANDARD  
FOR  
RUBBER  
INSULATION

Okonite  
Insulated

# Wires and Cables

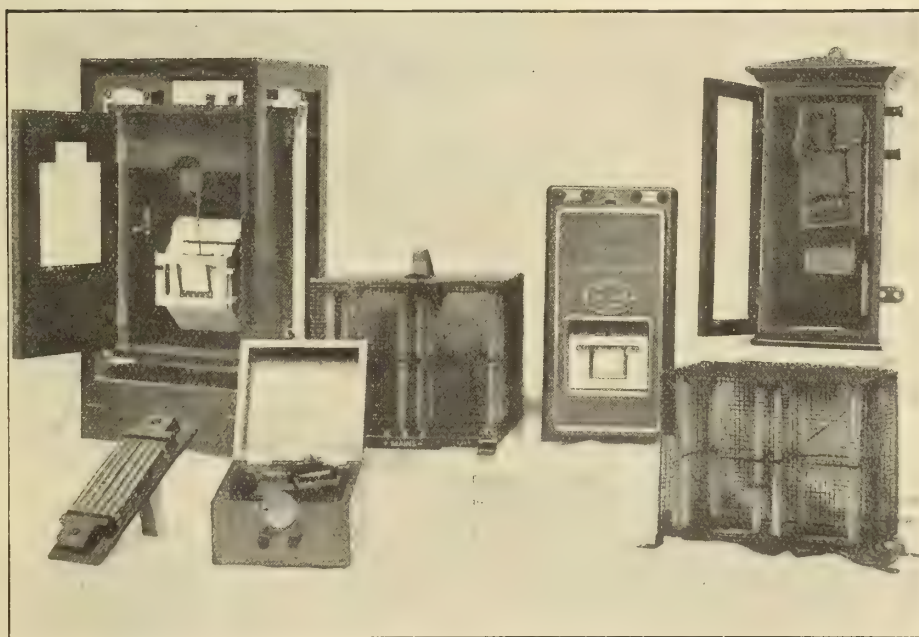
maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Chandee } Managers.  
H. Durant Cheever }  
Geo. G. Manson, General Superintendent.  
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W. C. Chandee, Assistant-Secretary.

The OKONITE COMPANY, LIMITED  
253 Broadway, NEW YORK, U.S.A.

## INKLESS RECORDING WATT, POWER FACTOR, AMPERE, VOLT and FREQUENCY METERS



Tramcar  
Instrument  
  
Resistance  
Cage  
Shunt  
Spring Clock

Switchboard  
Type  
Instrument  
  
Resistance  
Cage  
Pendulum  
Clock

NO INK

NO PEN TO SCRATCH

NO PAPER FRICTION

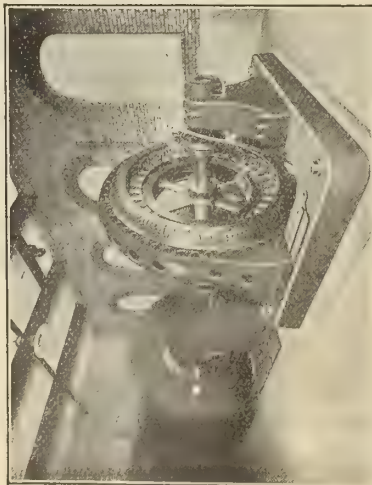
Large Stock in Toronto

WRITE FOR CATALOGUES

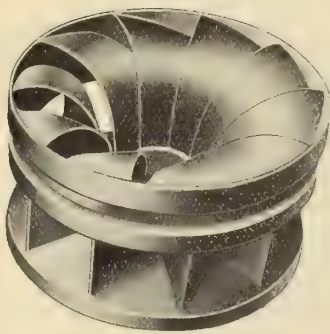
State Characteristics of Your Circuit

**J. F. B. VANDELEUR, Dineen Bldg., TORONTO, CAN.**

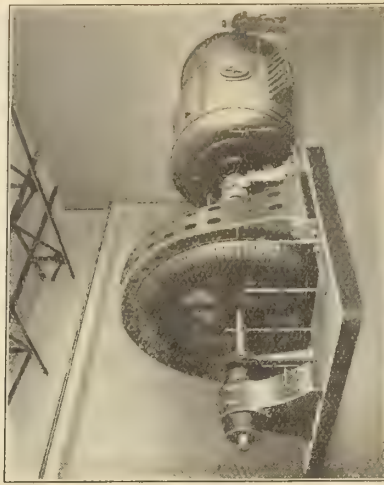
# HYDRO ELECTRIC PLANTS



**425 K. W. WATER WHEEL TYPE  
ALTERNATOR**  
Bulletin 1050.



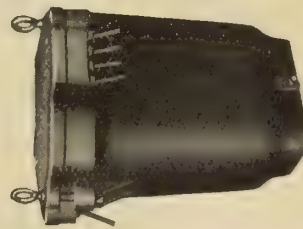
**WATER WHEELS**  
for heads up to 600 ft. and capacities to 20,000 h.p.  
Bulletin 303.



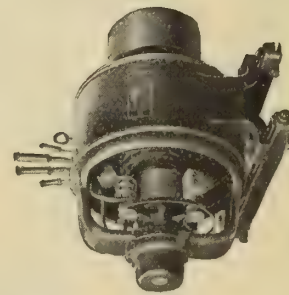
**1500 K. W. WATER WHEEL TYPE  
ALTERNATOR**  
Bulletin 1050.



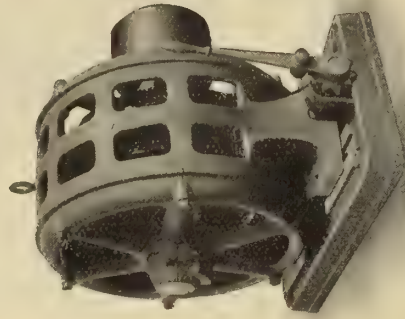
The Ball = Mark



**TRANSFORMERS**  
Lighting Bulletin 300.  
Power " 1047.

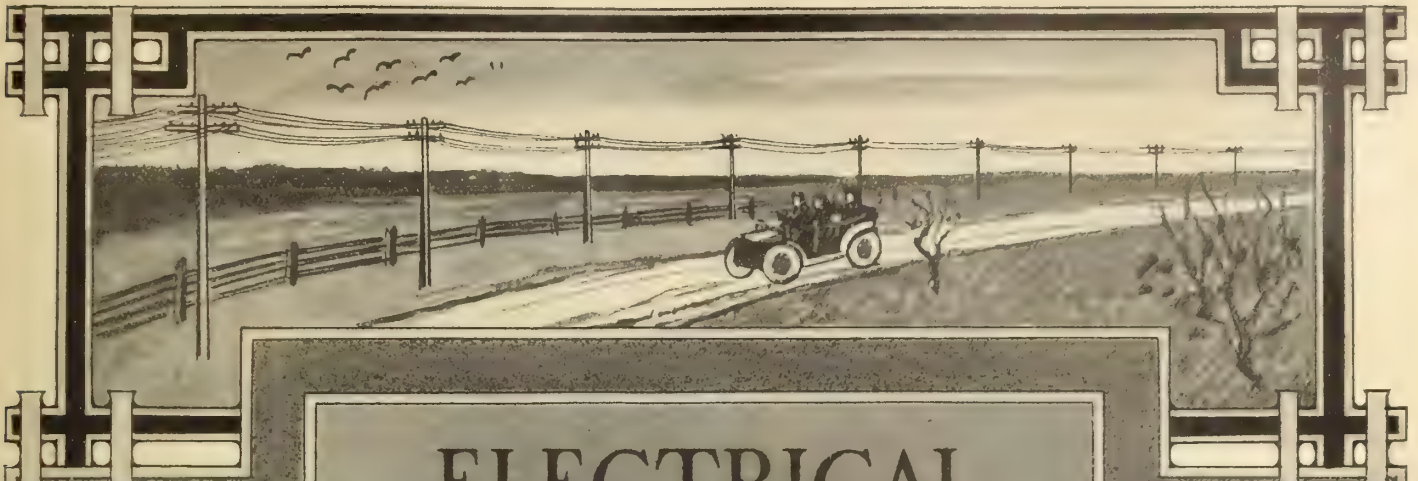


**DIRECT CURRENT  
EXCITERS**  
Bulletin 1057.



**INDUCTION MOTORS**  
Bulletin 301.



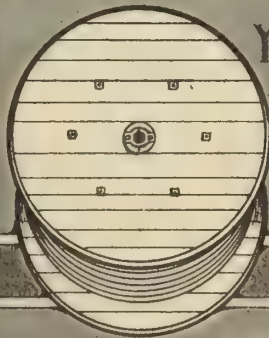


# ELECTRICAL WIRES AND CABLES FOR ALL PURPOSES

Power Cables, Lead Covered Cables  
Paper and Rubber Insulated Cables  
Rubber Covered Wire  
Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
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Etc, Etc, Etc.

LET US ESTIMATE ON

YOUR REQUIREMENTS



*The* WIRE & CABLE CO  
HEAD OFFICES . . . MONTREAL

Send Your Enquiries for

# Electrical Supplies

including

**Knife Switches**

Our Leaders

{ Baby Knife D. P. S. T. 15 and 25 Amp 125 Volts.  
{ Type E., D. P. S. T. Plain and Fused 30 A. 250 Volts.

**Switch Boards**

To meet every requirement.

**Bell Ringing Transformers**

A substitute for batteries.

**Hubbell Specialties**

Write for Hubbell Catalogue.

**Adams Bagnall Arc Lamps**

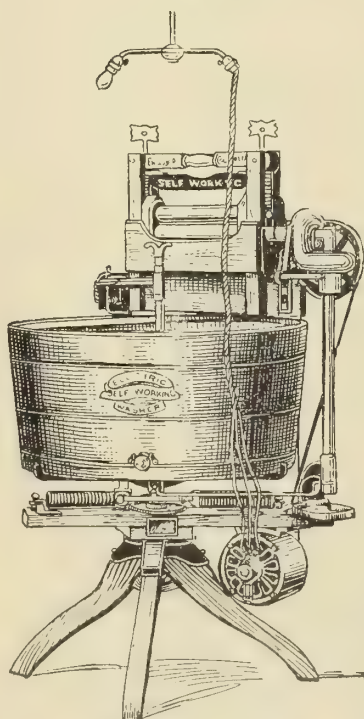
**Moloney Transformers**

**Siemens Carbons**

To

**The R. E. T. Pringle Co., Limited**  
**Montreal - Winnipeg**

## WE SOW—YOU REAP



We go the **limit** in cooperating with Central Stations. We offer a big **current selling** help in our "1900" Electric Washer and Wringer and place it **without** requiring a cent of investment of the Central Station. **All** you have to do is to **tell** us to whom the machine is to be sent. You needn't **sell** it, your customer **needn't pay** a penny to get the machine. We send it on 30 days **free** trial and let the **machine** sell itself.

**All** you need do is to get your customer's **permission** for us to send the machine at **OUR** expense.

**A "1900" Electric Washer  
and Wringer** **Thirty  
Days Free**

The "1900" Electric Washer and Wringer is a **perfect** machine. It washes the **biggest** pieces and the **finest** pieces. **Anybody** can operate it—even a **child**. It is **so** generally satisfactory that **each one** sold sells **several** others. **Actual experience** shows th t it not only increases the sale of **current** among a Station's present customers, but actually **gets new residence business**—from **one to three new customers** per year for every machine sold. Remember—**we** stand **all** the expense. Write **to-day** for a machine to exhibit in your showroom and for details of our plan regarding **your** territory.

The

**"1900" Washer Company,** 357 Yonge Street **Toronto, Can.**



Dr. Kuzel's Patent

# "Kolloid-Wolfram"

TRADE MARK

## Tungsten Lamps

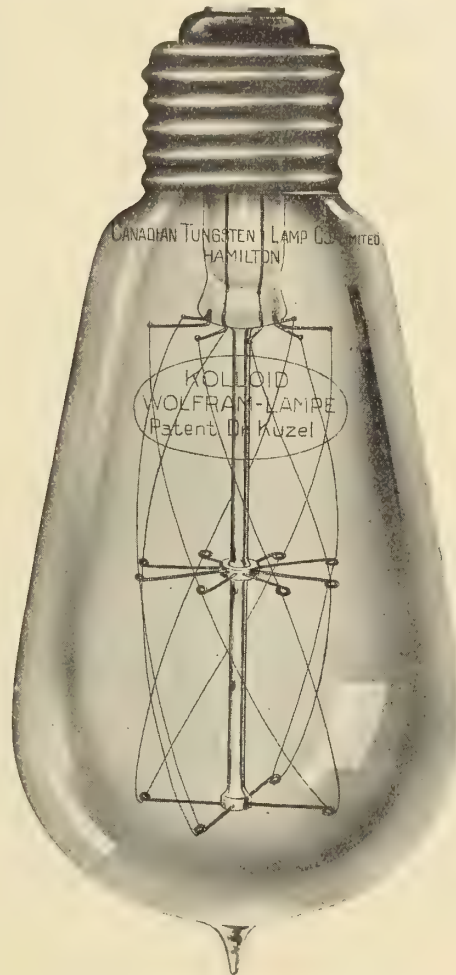
THE ONLY GENUINE ORIGINAL METALLIC FILAMENT LAMP

Whitest  
Light

Highest  
Efficiency

Lowest  
Wattage

Saves  
66  $\frac{2}{3}$ %  
Current



Average  
Life

1000  
Hours

Burns  
Any  
Angle

Alternating  
or Direct  
Current

16, 20, 25, 32, 50, 75, 100 Candle Power, 110, 115, 120 Volts  
32, 50, 75, 100 Candle Power, 225, 250 Volts.

WRITE FOR PRICES

Manufactured and Sold only by

# The Canadian Tungsten Lamp Co., Limited

Hamilton - Ontario

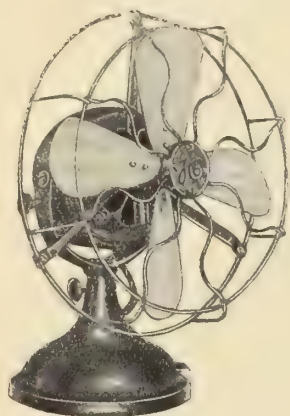
Operating the ONTARIO LANTERN & LAMP CO., Limited

# C. G. E. Fan Motors

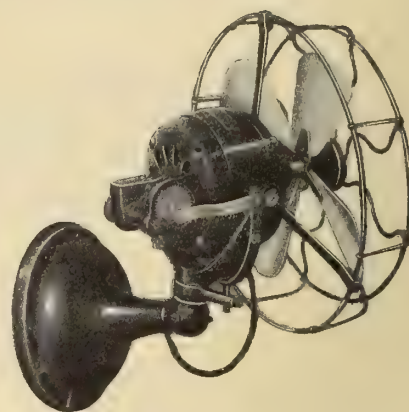
Desk and Ceiling Types  
and

Ventilating and  
Exhaust Fans

are as perfect as it is  
possible to manufacture  
this class of apparatus



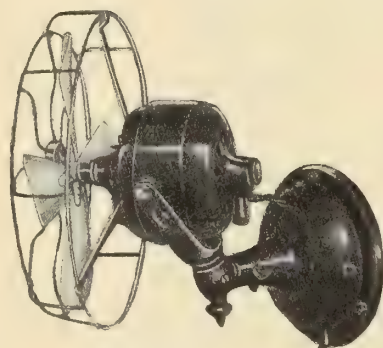
DESK TYPE.



OSCILLATING TYPE.

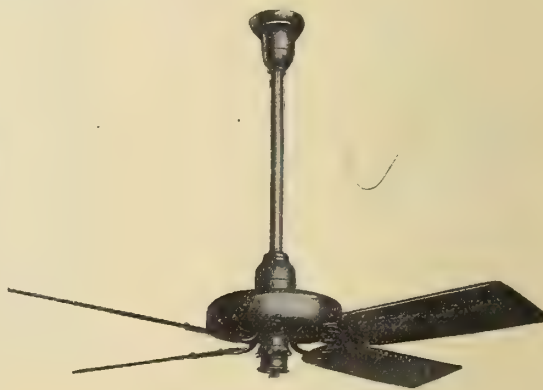
FREEDOM FROM VIBRATION AND NOISE  
NEATNESS IN DESIGN  
STRENGTH OF CONSTRUCTION  
RELIABILITY IN OPERATION

are among the many characteristics



BRACKET TYPE

Are you  
ready for  
the demand ?



CEILING TYPE.

Prompt delivery of all standard types

Write our nearest district office for prices and special sale terms

## Canadian General Electric Co.

Head Office: Toronto, Ont.

Limited

District Offices: Montreal, Halifax, Ottawa, Cobalt, Winnipeg, Vancouver, Rossland



# Opalux Reflectors

Most Shades for High Efficiency Lamps lack the artistic appearance required for Residential Work, etc.



Bowl Type.

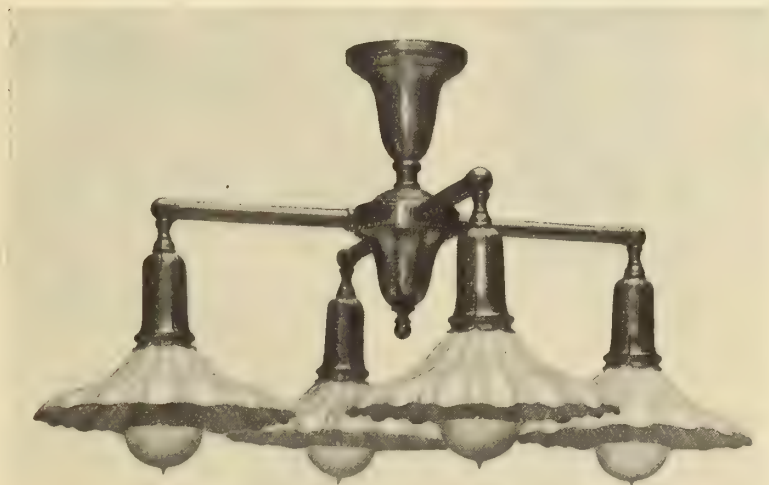


Distributing Type.

**No Sharp Contrast or Glare**

Made in three Sizes and two Styles only.

**These Meet All Requirements**



Descriptive Catalogue and Prices upon request.  
Both will be found interesting.

## Canadian General Electric Co.

Head Office : Toronto, Ont.

Limited

District Offices : Montreal, Halifax, Ottawa, Cobalt, Winnipeg, Vancouver, Rossland

## Personal Mention

We understand that Mr. George W. Lang has resigned as assistant superintendent of the Ottawa Electric Railway, to engage in business for himself at Calgary, Alta.

Mr. L. G. Ireland, of Smith, Kerry & Chace, is in charge of the installation of the Seymour Power & Electric Company's plant at Campbellford, Ont.

Mr. Roderick J. Parke, of Toronto, sailed recently for England. He will spend two months on the Continent and will devote a portion of his time to the study of European methods of power transmission.

Mr. C. B. Hunt, of the London Electric Company, has recently returned from an extended Mediterranean trip much improved in health.

Mr. Charles H. Wright, lately district manager at



**W. D. Black,**  
President-elect of the University of Toronto Engineering Society

Ottawa, Ont., for the Canadian General Electric Company, has been appointed district manager for the same company at Halifax, N.S., controlling the Maritime Provinces and Newfoundland. Mr. Wright has been with this company for many years in various engineering and business positions.

Mr. Charles G. Ericson, formerly of the steel and rail department of R. W. Hunt & Company, has been appointed inspector of structural steel work, and will have charge of the erection of the transmission line towers for the Hydro-Electric Power Commission of the Province of Ontario.

Mr. Thomas H. McCauley, superintendent of the Port Arthur franchises, has been appointed manager of the new electric street railway in Calgary.

Mr. Charles F. Medbury has been appointed manager of the Montreal office of the Canadian Westinghouse Company, as successor to Mr. H. D. Bayne.

Mr. C. W. Stokes, formerly manager of the Kenora Electric and Telephone System, is now associated with

the Northern Electric and Manufacturing Company, taking charge of the electrical apparatus for the Toronto district.

Mr. G. Gordon Gale has been appointed acting general superintendent of the Hull Electric Company, Aylmer, Ont.

Mr. W. F. Simmons, for some years identified with the Kingston Light & Power Company, Kingston, and recently superintendent of the Peekskill Lighting & Railroad Company, of Peekskill, N.Y., has been appointed as Canadian agent for the R. W. Marshall & Company.

Mr. H. E. Kensit, M.I.E.E., of Smith, Kerry & Chace, Toronto, was recently in Lethbridge, Alta., in connection with the awarding of tenders for the municipal light, heat and power plant.

Mr. L. A. Herdt, E.E., Ma.E., was recently appointed professor of electrical engineering in the faculty of applied science by the Board of Governors of McGill University.

Mr. S. B. Clement, B.Sc., formerly with the Canadian Electric Company, Chaudiere Falls, P.Q., and Canadian Niagara Power Company, Niagara Falls, has been appointed chief engineer of the Temiskaming & Northern Ontario Railway.

Mr. E. P. Featherstonhaugh, B.Sc., honor graduate of McGill University and a member of the Canadian Society of Engineers, has been appointed lecturer in electrical engineering to Manitoba University, his appointment taking effect in July. For some time Mr. Featherstonhaugh has been associated with the Canadian Westinghouse Company at Winnipeg.

## National Underwriters' Meeting

The convention of the Underwriters' National Electric Association, in recent session in New York City, was largely attended and provoked much interesting discussion. A proposal to amend the code by striking out the clause which compels a main line switch in front of the meter, caused a lengthy discussion. The object of this amendment is to prevent the stealing of current by the use of a jumper. It was opposed by electrical manufacturers who have placed on the market a variety of detecting devices. Finally it was referred to an electrical committee for investigation.

A new electrical code will be issued in July separate from the marine department. It was decided that owing to the few changes to the code it would be inadvisable to hold a meeting next spring.

Mr. H. F. Strickland, of Toronto, chief electrical inspector of the Canadian Fire Underwriters' Association, was in attendance. The double-outlet conduit box in use in Toronto was favorably commented upon by the convention.

## Buenos Aires in 1910

The Argentine Republic will hold an International Exhibition of Railways and Land Transport at Buenos Aires from May to November, 1910

## Kamloops Cheap Power

A recent four-hour test was made at the Kamloops, B.C., power house. 2,460 pounds of fuel were consumed with an average load of 95 k.w. per hour. To this was added 9 per cent. for current distributed aside from meters, so that the cost of fuel worked out well under one cent per unit.



# **ANNOUNCEMENT**

On June first we will commence making PROMPT  
deliveries of

# **Sunbeam Tungsten Lamps**

**Made in Canada**

at our New and Magnificent

**Plant at Toronto**

Write for our new REDUCED PRICES

**The Sunbeam Incandescent Lamp Co.  
of Canada, Limited**

**Factories:**

**Toronto and St. Catharines**

**Main Office:**

**Toronto, Ont.**

Northwestern Office and Warehouse: **Winnipeg**

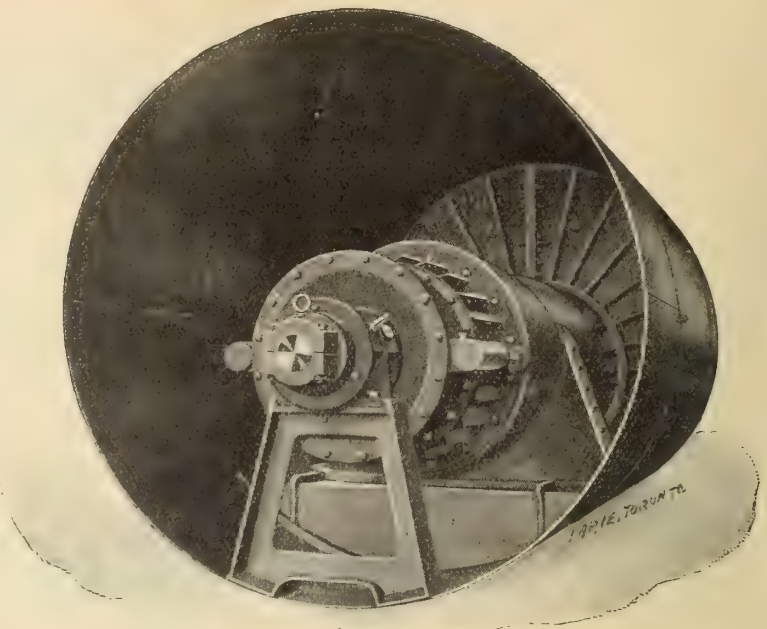
# Hydraulic Turbines

If interested in Water Power development let us tell you about our Improved Turbine.

Built in a wide range of sizes and for any setting.

After studying the conditions we design each installation to give the maximum of power and efficiency.

Bulletin 202 sent on request.



## The Jenckes Machine Co., Limited

Sherbrooke

St. Catharines

Cobalt

Vancouver

Halifax

Works: Sherbrooke, Que. St. Catharines, Ont.



Can Ship Immediately

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent. overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

# John Forman

Electrical Supplies

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# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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THOS. C. YOUNG, Toronto, Business Manager.

JAMES FISHER, Toronto, Advertising Manager.

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Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired without cost to the advertiser.

## SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada, post free, for \$1.00 per annum. The price of subscription should be remitted by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited. Please do not send cheques on local banks unless 25 cents is added for cost of discount. Money sent in unregistered letters will be at senders' risk. Subscriptions from United States and foreign countries embraced in the General Postal Union, \$2.00 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such understanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of the paper.

## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## The Advent of the Tungsten Lamp

Central station men in Canada no longer fear the advent of the modern tungsten lamp, but rather welcome its admittance to the commercial field. True, there is the fact of reduced income to be faced owing to the great economy effected by these lamps, but the experience of our neighbors across the line and of continental managers is very encouraging. They have found that while the individual accounts have been decreased, the showing of the total revenue has, if anything, been augmented.

When the tungsten lamp was first introduced it did not prove satisfactory. The experience of "A Station Man," who in a recent issue of the *Electrical News* informed us that it cost him 32 cents a shine for his first investment, has probably been encountered by many central station men in Canada. This has left a decidedly disagreeable impression, but inquiry has revealed the fact that unscrupulous manufacturers were shipping into this country the culls of their output.

Fortunately this condition no longer holds, and Canadian markets are being supplied with the best grades

of tungsten lamps. Well known lamp firms in Canada are studying this lamp, and with the experience of predecessors in this line of work we may expect from them highly efficient and economical lamps.

The chief point of vantage to which we would direct the attention of the central station man is the vastly improved chances for competition with the gas companies. With the coming of the tungsten lamp these companies can no longer truthfully make use of the statement that they can furnish a more brilliant illumination at a smaller cost. The admitted economy of the gas mantle over the carbon lamp, reckoned in cost per candle power, has long been a thorn in the side of the central station manager. Remember, that now with the tungsten lamp you are supplying your customer with more than double the illumination possible with the carbon filament lamp of the same wattage, and can compete on equal terms with the gas man.

The first cost of the tungsten lamp will be found to be higher than the carbon lamp owing to the delicate process of manufacture, but in the long run the low cost of operation and greater length of life of the former will make it the more economical light.

The brilliant white light of the tungsten lamp, made possible by the extremely high temperature at which the lamp operates and the fact that it burns throughout its life with a loss of candle power not exceeding from five to ten per cent., are talking points that should not be overlooked in discussion with the prospective customer.

## Electric Railway of the Future

It is only consistent with the rapid progress in hydro-electric power development and efficient system of high tension current transmission, to expect that the railway statistics of Canada during the next decade will show a rapid growth in the number of miles of electrically operated roads. Even now, almost ninety millions of capital is invested in nearly 1,000 miles of line, and of this, 178 miles were added during 1908.

It is interesting to note that the electric railway companies are deriving their revenue not only from passenger traffic, but also from a goodly share of the freight, express, and mail carrying business of Canada. In the United States they have their interurban railways operating upon public highways, and high speed roads operating upon their own right-of-way, free to make the fastest practicable schedules. The restrictions to the speed limit of electric street railways shown by the schedules and rendered imperative by the paramount consideration of public safety, are bound to bring about a similar electric interurban service for Canada. The objective now of the Dominion Power & Transmission Company, owners of the Brantford & Hamilton Railway, is to eventually connect Toronto and Detroit. Then, too, as the population of our large cities increases, as they are doing rapidly at the present time, it will be necessary that we have high speed cars in order that people can live well beyond the congested commercial



centres and daily pass between home and business, without suffering a prohibitive loss of time. Transportation facilities will have to keep pace with the development, and natural tendency to spread out, unless we wish to build up apartment house cities.

In the general transformation the question of electrification of steam railways will come in for its share of discussion. This type possesses many obvious advantages over the electric road, for it is as yet a matter of experiment to ascertain the most efficient method of electric car operation. Direct current systems have been superseded by the alternating form, only to revert to the former system. It is noteworthy that the Great Northern Railway are spending \$1,200,000 to develop electric power for the purpose of operating four large three-phase locomotives for use in freighting, on the heavy grades of the Pacific coast. The question will not be one of electrification of operating steam roads so much as the building of new electric roads, for, with the steady advance in electrical design, and with the coming network of power lines that will soon radiate from Niagara Falls and other Canadian centres, we may feel certain that electrical operation will be on an equal footing with steam and a comparison will in due course be in favor of the electrically operated roads. There are many advantages possessed by the electric car, and one of these is exemplified during the winter months. The sudden fall of temperature which has a chilling effect on the steam boiler and steam chest, often causing a freeze-up of the locomotive, has a beneficial effect on the resistance of the field and armature coils of the railway motor, consequently the electrical efficiency of the latter improves with proper attention to the lubrication.

It has always been a prohibitive plan to operate motors from a lighting circuit on account of the disturbance produced at the moment of starting up. Polyphase motors take from three to eight times normal current when starting, since at this time full normal torque is required. It is now being proven that the single phase motor will very appreciably overcome this difficulty, and as its design becomes more efficient we may expect the operation of single phase motors from lighting circuits without irritable inconvenience to the lighting system, and this will effect a great saving in the initial cost of electric railways that can be fed from existent lines.

### Growth of Electro-Chemistry

Scientists are every day finding their dependence on electric current as a solution to many knotty problems which have barred their further advance in research work. Perhaps this is especially applicable to the chemist, and we find that direct attention is now paid to the application of electricity to chemistry and that at least one of our great Canadian universities has recently added a course in chemical engineering.

The "Electrical Review" a short time since described a phase of this electro-chemical development that has been interesting English scientists for a number of years, namely, a method of obtaining nitrogen from the air.

It is interesting to trace the development of the electric process involved in the manufacture of this product. Nitrogen has long been recognized as a valuable fertilizer for agricultural districts and the unsupplied demands have been the incentive to the discovery of a method of rapid and cheap production.

Experiments were commenced on a small scale, using a plant of 100 horse-power and operating by means of a step-up transformer at a voltage of 50,000. This voltage was impressed to an electrode suspended in a tower known as a "flame receptacle," through which air was conveyed to an absorption plant. This plant was very unsatisfactory for many reasons and in their up-to-date systems of to-day many of these disadvantages have been overcome. New type electrode furnaces and absorption chambers have been designed and supplied with surface coolers for the hot nitric oxide gases, which have a tendency to break up after combustion unless immediately cooled. The gases are then allowed to pass into an oxidizing tower where, in contact with oxygen, they are transformed into nitrogen peroxide, a gas which readily dissolves in water, forming nitric acid ( $\text{HNO}_3$ ).

The electrical part of this installation consists of a newly designed furnace, one of the features of which is the combination of the magnetic field with the electric flame, in such a way that the arc flame is deflected by the field. With comparatively small power employed tests show a minimum output of at least 60 grammes of ( $\text{HNO}_3$ ) per kilowatt hour for furnaces of this kind.

Many other experiments have been tried and with varying success. The above furnace has been adapted for either direct or alternating current and with direct current has been operated successfully at 1,500 volts

### The Quebec Convention, June 16, 17 and 18

Last month the "Electrical News" called the attention of central station men and electrical engineers to the approaching convention of the Canadian Electrical Association. We are now a month nearer the date. Have you followed the advice given, and made your plans to be in attendance?

Perhaps you hesitate on the ground that you haven't time. Don't let this serve as an excuse—there will be men holding your position when you are somewhere else. Make your arrangements and come along. The trip will not only be beneficial as a holiday, but you will return with many new ideas after a contact with your brother engineers.

Arrangements are nearing completion and we are assured of a fine convention. No need to dwell on the hospitality of the Quebec fraternity, those who visited the city in 1902 when the convention was held in Quebec, will bear testimony that it is of the best.

The June "Electrical News" will be a special convention number, with a handsomely designed cover. Besides giving a full programme of the convention, it will contain much information to guide the visitor in making the rounds of the points of electrical interest.



# Letters to the Editor

## Specific Instances Asked For

To the Editor of the *Electrical News*:

Dear Sir,—I have read "X. Y. Z.'s" recent communication, wherein he states that he is aware of three or four serious accidents which have resulted from the ungrounding of secondaries. Although I do not for a minute doubt the veracity of "X. Y. Z.'s" statement that accidents have occurred from this cause, I would, for the edification of members of the electrical fraternity in general, request that he give specific instances, outlining in each case, just how the accident occurred; this would undoubtedly prove to be interesting reading. If "X. Y. Z." can submit positive proof to the effect that the accidents to which he refers could not have taken place had the secondaries been grounded, then let the Canadian Electrical Association issue an ultimatum to the effect that all secondaries of all systems must be grounded and grounded well, and let the question end at that; but the point is this: for the past ten years we have heard nothing in the electrical line except controversial discussion over the grounding of secondaries; no light has been thrown on the matter, so far as I am aware, and we are still groping in an impenetrable fog of uncertainty, which is from time to time intensified by some irresponsible member of the association training his guns on the secondary matter and firing terrific broadsides of hot air, the results being entirely unsatisfactory, as nothing definite is ever determined upon. Some inform you with bated breath that in the interests of humanity you should ground; if you endeavor to converse with others on the matter you will be promptly informed that you're nutty and requested to take a sneeze to get the dust out of your brain. We want to know where we're at, so it's up to the powers that be of the Canadian Electrical Association to dispose of the matter now—once and for all time to come—by handing out a definite ruling. Let's have it quick, please.

LIVE WIRE.

April 2nd, 1909.

## Thetford Mines Arbitration

To the Editor of the *Electrical News*:

Dear Sir,—My attention has been called to an article in the March issue of the *Canadian Electrical News*, page 19, signed by Mr. M. A. Sammett, the arbitrator for the mining companies, and on looking into the matter I find that his article refers to a brief mention of the arbitration proceedings between the Shawinigan Water & Power Company and the Mine Owners of the asbestos mines at Thetford Mines, and published in your paper dated February, 1909, which states that the award was made in full in favor of the Shawinigan Company. Mr. Sammett states in his article that the information is not in accordance with the actual facts.

I am at a loss to account for Mr. Sammett making this statement, as the mine owners made several distinct and specific claims for damages, cancellation of contracts, etc. These claims were presented to the arbitrators by the Mine Owners' representative, and before the arbitrators had concluded their work, one of the Mine Owners withdrew from the arbitration proceedings, and not a single claim presented by the Thetford Mine Owners for damages, cancellation of contract, etc., was allowed by the arbitrators.

In proof of this statement, I submit herewith a letter from the third arbitrator, who distinctly and positively states that no claim was allowed by the arbitrators.

Yours very truly,

Montreal, April 13, 1909.

R. S. KELSCH.

In reference to the foregoing letter the statement of the third arbitrator is interesting. He says in part: "There can only be one answer to the question of whether any of the claims of the mine owners were allowed and that is 'No.' This, however, does not take into account the question as to whether there was any reason for dissatisfaction, but includes only the question as to whether the mine owners were entitled to any compensation for alleged defects in service."—The Editor.

## Niagara River Blockade

The actual damage caused to the power companies by the recent ice jam in the Niagara river has not yet been ascertained. The exceptionally heavy winds during the early days of April loosened large quantities of ice from the Falls, which jamming, caused a rapid rising of the waters.

On account of its situation below the Falls, the Ontario Power Company was the greatest sufferer and at the time of writing it is still shut down for repairs. Water and ice found their way into the dynamo room and completely submerged their big machines. The other companies were able to assume the majority of the load of the Ontario Company and the value of the unity of the development system was demonstrated. In Toronto both the Toronto Street Railway and the Toronto Electric Light Companies operated their steam plants, thus enabling the Electrical Development Company to assume a large proportion of the Ontario Company's load.

It is understood that the power house of the Ontario Power Company has been strengthened and a recurrence of the present disaster practically rendered impossible. The Westinghouse Electric Company are repairing the machinery and are adopting the usual method of drying out the generators, namely, short circuiting the armature and passing through it a no-voltage, full load current, at first slowly revolving, and gradually increasing the speed. This process is very effective and should restore the dynamos without the necessity of rewinding.



# Brantford and Hamilton Electric Railway

## Section of Proposed Interurban Electric Railway System Description of the Road and Power Equipment

In the completion of the Brantford & Hamilton Electric Railway on May 23, 1908, the Dominion Power & Transmission Company, Limited, of Hamilton, Ont., secured an important link in the all-electric system it has planned to join Toronto and Detroit—a distance of over 500 miles—via Woodstock, London, Chatham and Windsor. At the present time this company operates 22 miles eastward from Hamilton to Oakville, within 19 miles of Toronto, and 22 miles westward to Brantford. Bearing in mind the eventual operation of through long-distance



Rock Cut Near Hamilton—Brantford and Hamilton Electric Railroad.

service, these lines have been constructed on right-of-way wherever possible, with such low grades and easy curves that real speed competition with steam trunk lines will be more than a possibility. The accompanying map covers the section between Brantford and Toronto, and shows the courses of the following railways centering at Hamilton controlled by the Dominion Power & Transmission Company: Brantford & Hamilton Electric Railway; Hamilton, Grimsby & Beamsville Electric Railway, and the Hamilton Radial Electric Railway.

The Brantford & Hamilton Electric Railway covers a route of 22 miles with 22½ miles of single track. The greater part of the road from Hamilton is a uniform climb to a height of 600 feet in 6 miles along the side of a mountain overlooking the prosperous and picturesque Dundas Valley. The maximum grade, despite the ascent, is only 2½ per cent., and the tangent sections are unusually long—that from the summit west to Fairchild's Creek being fully 9 miles. The disintegrated limestone of which the mountain is composed, while easy to remove, makes a rather treacherous foundation. The track, therefore, has been well ballasted with gravel from the company's pits at Brantford, and the cuts and fills are more liberal than they would have to be in firmer strata.

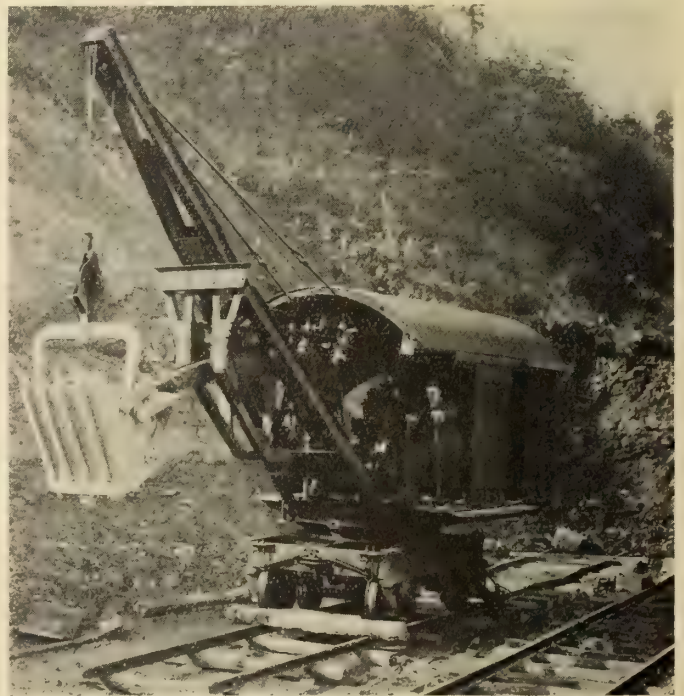
The rails, which are of 80-pound T-section, are laid on cedar ties spaced 2 feet centres, with staggered angle-bar joints carrying American Steel & Wire Company's No. 00 bonds. The same construction is followed in the city, except that the base is 6-inch concrete with brick paving. There are several concrete culverts and two steel bridges, one at Fairchild's creek and one over the tracks of the Toronto, Hamilton & Buffalo Railway (steam), and a short temporary trestle in Brantford. The cattle guards

are home-made, consisting simply of a set of inclined slats laid across the track.

A valuable factor in the construction of the line has been an automatic shovel, built for electric operation by the Thew Automatic Shovel Company, of Lorain, Ohio. This shovel, unlike the steam apparatus, does not require three sets of engines for the independent control of the hoisting, swinging and crowding motions, but is operated by one 35-horse-power, shunt-wound constant-speed Westinghouse d.c. motor controlling the various motions through suitable frictions. The manufacturer has designed this electric shovel with planetary transmission gears for controlling the swinging and crowding motions from a main motor, to do away with many of the difficulties which friction clutches have given in this connection.

Current is supplied from the feed wire to the motor through flexible cables connected through switches to copper rings upon the upper side of the truck frame. The current is transmitted through carbon brushes suspended from the underside of the turntable coming into contact with these copper rings. This electrical operation eliminates the fireman, worry about fuel and water and trouble from freezing. In operating this shovel it is desirable to have the current supply independent of line fluctuations.

The shovel is mounted on one truck, weighs 25 tons,



Electrically Operated Shovel—Carried on Single Truck.  
Brantford and Hamilton Electric Railway.

and has a 24-foot cutting radius at a height of 9 feet. The dipper is 1 to 1½ cubic yard capacity, according to the nature of the material. The horizontal crowding motion of the dipper is a special feature which makes it entirely practicable to dispense with a craneman, so that all movements can be controlled by one operator. In



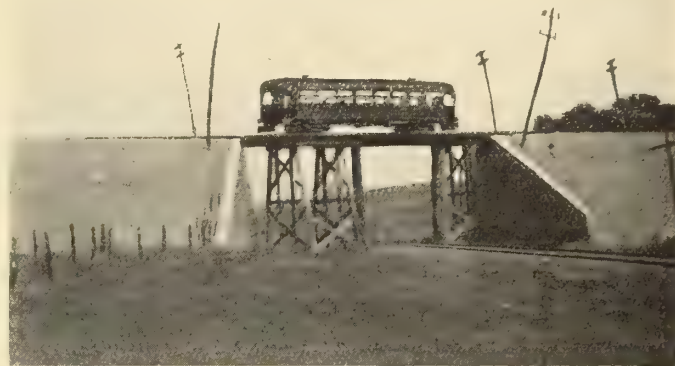
the construction of the Brantford-Hamilton line one man operated the shovel and another tripped it.

The average cost of handling material with this shovel runs about 0.10 cent per cubic yard, but in the following unusually favorable case the plain labor cost for a day was much less, as will appear from the following details: When this shovel worked in the gravel pit the depth of the cut was about 14 feet. The gravel was loaded onto flat cars having 14 cubic yards capacity each, and frequently 100 loaded cars were hauled away daily. This meant an output of 1,400 cubic yards loose measurement, or 1,050 cubic yards placed measurement. The men employed and the wages paid in this work were as follows: Superintendent, \$4; shovelmen, \$3; pit men, \$1.50; motormen, \$3; trainmen, \$1.50; dump men, \$1.50. The labor cost for a day was \$29.50, divided as follows: One superintendent, \$4; shovel crew, consisting of two shovel men and two pit men, \$6 and \$3 respectively; one motorman at \$3, and one signal man at \$1.50 for spotting cars; transporting two trains, requiring two motormen at \$3 each and two trainmen at \$1.50 each; and two men at the dump at \$1.50 each. With 1,050 cubic yards moved in a 10-hour day, the labor costs were as follows: Superintendence, \$0.004; loading, \$0.013; transportation, \$0.009; dumping, \$0.003; total, \$0.029. When the output fell to 800 cubic yards, place measurement, the total unit labor cost was \$0.037. This extreme minimum figure, of course, does not include charges for power, plant, repairs and track work.

The power supply for this railway comes from De Cew Falls, about 40 miles from Hamilton, and is transmitted at 40,000 volts, three-phase, 66 cycles to substations at the mountain top (No. 1) and Langford (No. 2), respectively 3 and 15 miles from Hamilton. There is also a general substation in Hamilton. Along the Brantford-Hamilton right-of-way this transmission is carried on 40-

type. The low-tension poles carry on glass insulators a No. 0000 feeder fed in one direction from substation No. 1, at the mountain top, and in both directions from station No. 2 at Langford. Feeder taps are made every quarter of a mile. The low-tension line is provided with GE lightning arresters every half-mile.

Both the Bartowville and Langford substations are designed for three 300-k.w. motor generator sets, but have at present only two-thirds of that capacity. Each generator set consists of a 440-h.p., 2,400-volt, 66-cycle, three-phase, 666-r.p.m. synchronous motor direct connected to a 300 k.w., 600-volt, d.c. generator. Each set is furnished with an 11-k.w. exciter. The two 300-k.w., 40,000/2,400-volt transformers are of the oil-insulated, self-cooling shell type. Lightning protection on the low-tension circuit is given by tank arresters and on the high-tension side by low equivalent arresters. The switch-



Fill and Crossing at Cainsville, on the Line of the Brantford and Hamilton Electric Railway.



A Typical View Showing Curve—Brantford and Hamilton Electric Railway.

foot cedar poles 180 feet apart, over Thomas triple-petticoat insulators. A ground wire is carried above the high-tension wires for lightning protection.

The line for the d.c. circuits consists of 30-foot cedar poles, which are spaced 90 feet apart on tangents, except that the alternate poles on one side are those forming the carriers of the high-tension wires. From this it will be understood that the entire line construction is of the span

board in each station is composed of two a.c. panels and one d.c. panel, with the usual switches and instruments, including power factor meters. All of the electrical equipment is of Canadian Westinghouse manufacture.

Both stations are single-storey structures, built of reinforced concrete, and, aside from the loading platform, cover an area of 50 feet x 33 feet 6 inches. The columns, which are 18 inches square and 28 feet high, are reinforced by a continuous hoop with six inside rods. These columns were concreted in one filling, and are believed to be the highest of this type in Canada. The column footings are 4 feet square and the piers 2 feet square. The roof, which was in place before the completion of the walls, is composed of 4-inch concrete slabs reinforced with plain round rods and laid over two 20-inch, 65-pound I-beams. Instead of a crane, each station has a 15-inch, 42-pound, I-beam track, which carries an 8-ton Brown hoist and Yale & Towne triplex block.

All passenger service is now cared for by six double-end Kuhlman cars, 56 feet over all, each equipped with passenger and smoking compartments. The cross seats in the coach section are of Brill "Winner" rattan, while longitudinal seats are used in the smoker to make room for trunks and other baggage. Both compartments have package racks. The trucks are of Brill No. 27 design, carrying four No. 112 Westinghouse 75-h.p. motors used with L-4 controllers; Westinghouse straight air brakes complete the power equipment. Among the other equipment features may be noted the following: Wilson trolley catchers, Crouse-Hinds headlights, Q & C steps, Consolidated electric heaters and Curtain Supply Company's window fixtures. The ventilator sash is wired glass. It will be seen from the foregoing that these cars are properly equipped with many essentials for high-class inter-



urban service. Their approximate weight without passengers is 72,000 pounds each.

The cities of Hamilton and Brantford have populations respectively estimated at 65,000 and 20,000, while the rich farming country between has only about 3,000. The electric railway already has taken practically all the old steam railroad passengers, and through its hourly service naturally has created other traffic. The schedule on all its lines entering Hamilton includes a theatre train, which brings the patrons to the terminal and gives them a covered walk to a nearby theatre controlled by the railway interests. The fares on the mountain section approach a three-cent basis, but elsewhere the cost is nearer two cents a mile.

The Dominion Power & Transmission Company, Limited, has no permanent station in Brantford as yet, but has erected in Hamilton a very handsome station for its various lines, making office provision at the same time for its 13 constituent companies. Terminal facilities are furnished for six railways. The building has a steel frame with solid masonry and terra cotta walls. The first storey is Indiana blue limestone and the rest of the structure of pressed brick with Perth Amboy terra cotta trimmings. The cornices and balustrades are also treated with artistic designs in terra cotta. The roof carries an illuminated clock with 6-foot diameter dial. The main entrance, which has a vestibule 22 feet square, is a strong feature, and two bronze electroliers on stone pedestals.

The interior columns and beams are of concrete reinforced with Kahn bars. The main floor is laid with ceramic tile, the office floors with hardwood, and the hallways with Terrazo. The walls are wainscoted with marble to a height of 10 feet, or half-way to the ceiling. The woodwork is of quartered oak.

The front part of the main floor contains the ticket office, and the back of it a vault extending from the basement to the second floor. The stairway and elevator to the offices are on the right. To reach the tracks, passengers leave the main room through one of five double doors opening on fenced enclosures.

Part of the basement contains the room for general electrical supplies, and another section has a motor-generator set which supplies light to the building on the three-wire system and current to every electric elevator in Hamilton. The three boilers which supply steam heat to this terminal and the nearby theatre are located under the tracks between these structures.

Particular attention has been given to both inside and outside lighting. The main floor is lighted by Nernst glowers placed in the ceilings and columns; incandescent lamps are used elsewhere. The metal passageways outside the building are studded with hundreds of small incandescents, which make this block the most brilliant spot in the city. Outlets are also provided for the illumination of the front of the terminal on gala occasions. The main distributing panel is on the station floor, and the sub-panels elsewhere are controlled by cut-out switches in the motor generator room.

As the Brantford-Hamilton line has been in operation only a year, it is possible to indicate the probable importance of the non-passenger business only by referring to an allied line like the Hamilton, Grimsby & Beamsville Railway Company, whose freight earnings are about 30 per cent. of the gross. All of the lines carry freight according to the standard Canadian classification; accept and, where necessary, prepay advance charges on freight emanating on other lines; and, in general, comply with the legal requirements and practices of steam railroads. Waggon deliveries of freight are maintained at the important stations, the charge for this service being two cents per 100 pounds, with a 12-cent minimum.

The company has a contract with the Dominion Express Company whereby the latter pays 12 cents per 100 pounds for all goods carried over its line, except inter-station traffic, which is handled exclusively by the railway company.

### Canadian General Electric Flourishing

The financial statement submitted to the directors by President Brock at the recent annual meeting of the Canadian General Electric Company shows splendid returns for the past year. During the year the company's original issue of preferred stock, amounting to \$300,000, was retired at par plus a premium of 5 per cent., and the maturing bonds of the Northey Manufacturing Company, amounting to \$160,000, were paid off. Current liabilities were reduced from \$2,191,266.99 to \$1,093,123.88, the result of a smaller inventory of raw materials and finished stock being required. Contingent liability on notes receivable discounted has been reduced from \$1,161,616.44 to \$302,518.17.

The liability account includes a reserve for depreciation of \$129,129, and is balanced by a surplus account of \$1,814,763.30, which shows a profit for the year ended Dec. 31, 1908, of \$753,088.12. This profit is somewhat in excess of the preceding year and was obtained on a decreased output. In the course of his report Mr. Brock said: "Notwithstanding the continued industrial depression, this company have been fortunate in securing several important contracts, which, added to current business, will keep us fairly busy during the year. During the past three months we have secured more orders than during the previous six months, and as present indications point to a material improvement in trade conditions, we look forward to the future with more confidence than at any time during the preceding year."

This statement must be very gratifying to the shareholders and those interested in the financial well-being of this great Canadian concern. The fact that they have so well withstood the depression of the last few years and are able to make this splendid showing speaks volumes for the management of this company.

The optimistic views expressed by the president for the coming year should be very encouraging to the electrical trade in general. Mr. Brock is a solid man and occupies a position where he can survey with a critical eye the commercial prospects of the coming year. Therefore we may look for a fulfilment of his predictions and a lifting of the fog that has bound this country so tightly, to the detriment of the electrical trade, in common with others.

### Trouble at Grand Falls, N. B.

There is prospect of war between rival companies over the development of the water powers at Grand Falls, N.B. The Grand Falls Power Company, composed chiefly of Americans, has begun preliminary work on the site and has made application to the Government to fix the amount of bonds to be given before they can expropriate property. This is opposed by another company of the same name, of which Sir William VanHorne is a member, and the claim is made that the company at present at work on the site has forfeited its charter by not starting work within the time required. The New Brunswick Government has the matter under consideration.

Wireless communication from Paris to Canada, a distance of over 3,000 miles, is maintained by the stations on the Eiffel Tower and at Glace Bay.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Question No. 1.—In shutting down a generator how low should the voltage be before disconnecting the field circuit?

Answer.—It is always wise to place all the resistance of the field rheostat in circuit before breaking the field circuit. The field switch is usually provided with a discharge resistance to absorb the kick, so that no harm results when the field circuit is opened, even if all the field rheostat has not been cut in. It is better in every case to reduce the voltage as low as permissible.

Question No. 2.—We have a 66-cycle generator and wish to install 60-cycle motors. Can we do this without injurious effect?

Answer.—Yes, you are quite safe in using 60-cycle motors on a 66-cycle circuit. The motors will operate at a correspondingly increased speed. Watt-hour meters will register the same on either circuit.

Question No. 3.—Kindly enlighten me as to why high voltage transmission lines are almost invariably strung with bare wires?

Answer.—One good reason for leaving off the insulation is that ordinary insulation covering has no protecting value from the high tension current; so that it only serves to increase the size and weight of the wire, while offering a greater surface to sleet, wind and rain. Everything considered, would it not be a good thing if in high tension sub-stations the wires were always brought in and continued uninsulated to the switchboard? I have in mind the case of a youth you touched a covered wire carrying 22,000 volts and was sent sprawling backwards. The almost valueless covering is apt to be misleading and consequently dangerous; to the uninitiated covered wire conveys a false idea of safety which would perhaps be partly removed if the wires were bared.

Question No. 4.—Does the cold weather in any way make transformers dangerous to operate?

Answer.—The only way in which the cold would affect a transformer would be through the oil. Almost all transformer oils are said to precipitate paraffine in extremely cold weather. Should this occur the oil would lose its dielectric strength, and cause trouble. However, cold will not affect a transformer constantly in circuit. Trouble, if any, will occur on the line that is shut down during the day time. Up to 2,200 volts very few transformers give trouble. It is the high tension transformers, say from 10,000 to 50,000, that have been out of commission for a couple of months, that are often completely frozen up during the severe winter weather.

Question No. 5.—Will you kindly define and explain the term power-factor?

Answer.—To answer your question intelligently a short review of power units will not be out of place. The power delivered to any direct current at any instant is equal to the product of the current in amperes (estimated by an ammeter placed in series with the circuit) and the drop in electro-motive force or volts (ascertained by placing a voltmeter across the line). In this case the power or watts, as it is called, is constant, since both the current and voltage are constant for a definite period of time. But with the alternating current the E.M.F. and current are constantly changing in accordance with a periodic law. Power is still equal at any instant to the product of volts and amperes at that instant. But alternating current instruments indicate the square root of the average squares of these instantaneous values, or what are called the effective values, and not the instantaneous values. The product of the effective volts and amperes is generally greater than the average of the products of the instantaneous volts and amperes. The factor by which this product of effective volts and amperes must be multiplied in order to obtain the true average watts is called the power factor.

Question No. 6.—Will you kindly give me information regarding the use of storage batteries in power plants?

Answer.—Storage batteries are either used in central stations for the purpose of obtaining an absolutely steady voltage, or for carrying part of the load during peak hours. By their use a great saving in the operating expenses may be effected. The plants installed for the first service, namely, steady voltage operation, are, as a rule, small and comparatively unimportant from a commercial point of view, being used for calibrating instruments, or for research work. Batteries installed under the second heading are put into those plants whose power or lighting load is, at its peak, beyond the capacity of the generators installed, though well within their output at other times, in which case the batteries are charged during the hours of smaller demand and discharged in parallel with the machines at the peak. The same holds true for railway work, which is perhaps the storage battery's greatest field, with the exception that as the demand on the bus bars varies tremendously from minute to minute, the battery is in a like manner continuously being charged or discharged simultaneously, with a rising or falling demand from the feeders for current. The object in both type of service being to reduce the generator capacity which would otherwise be necessary, and to keep the load on them and their driving engines as nearly uniform as possible, a necessary condition of maximum or even good economy. Plants put in to cut down operating expenses are generally left alone during the night hours to take care of the small number of lights which are usually required, thus doing away with the necessity of paying an attendant to watch the engines and generators, that would otherwise be required.

The new insurance bill introduced at Ottawa by the Minister of Finance contains a clause which prevents the agent of any insurance company not licensed in Canada from inspecting any risk or adjusting any loss on insurance carried by that company in Canada. This clause would tend to prevent companies like the New England Mutual Companies from carrying insurance in Canada. Opposition to the bill will be made by the Canadian Manufacturers' Association.



# Practical Treatise on Tungsten and Carbon Lamps

Showing by Charts the Results of a Series of Life Tests.  
Consideration of the Future of Metallic Filament Lamps\*

By H. D. Burnett

If some engineer should announce the discovery of a metal, or an alloy, having three times the tensile and compressive strength of the best steel—say 600,000 pounds per square inch—every mechanical and every civil engineer in the world would become intensely interested. Think of the revolution in bridge building and in other mechanical arts that such a discovery would effect. It would not, however, produce more excitement and interest in the mechanical world than the introduction of the tungsten lamp has produced in the field of artificial lighting.

The tungsten lamp transforms electrical energy into light at the rate of  $1\frac{1}{4}$  watts for each candle of light produced. The average carbon lamp in use at the present time in Canada, consumes over three times as much electrical energy or probably in excess of 4 watts for each candle of light produced. The average initial efficiency of 16 candle power lamps in Canada is above 3.5 watts per candle, and this efficiency rapidly becomes poorer as the lamp ages.

The tungsten lamp, starting with an efficiency 2.8 times that of the new 3.5 watt carbon filament lamp, maintains its candle power and efficiency much better than the carbon lamp notwithstanding the far higher temperature of the tungsten filament. The question naturally follows: What, then, stands in the way of a complete revolution in the incandescent lamp industry by the tungsten driving out the carbon? The chief objections urged against the tungsten lamp are:

(1) Its high cost, its price being five or six times that of the carbon lamp of similar c.p.

(2) Its fragility, the filaments being so delicate as to require extreme care in handling the lamps, and excessive mechanical breakage increasing the already high initial cost of the lamp.

(3) The lamps, until recently, have been procurable only in 32 and higher candle powers (above 100-volt), so that the small consumer was required to purchase more light than he required. This objection is now partially met by the supply of 25 watt or 20 candle power, and even lower candle power lamps, but it seems likely that the lower limit is now reached for lamps above 100-volt unless some radical changes be introduced in the process of manufacture.

(4) The high intrinsic brilliancy of the tungsten lamp, which involves the additional expense for shades in order to protect the eyes from the direct rays of light, while the use of such shades reduces somewhat the spherical efficiency of the lamps.

(5) To the consumer who pays for his lighting on the contract or "flat rate" system the tungsten lamp, of course, does not appeal, since its chief advantage over the carbon lamp is economy of power consumption.

The third objection to the tungsten lamp, which I have mentioned—its unsuitability to low candle powers in voltages above 100—is likely to keep the carbon filament lamp in demand for some time to come.

This objection can be, and is being, partly met in Europe and the United States by the supply of low voltage lamps (50-volt and below), which can be made of any desired low candle power. These may be run in series on ordinary lighting circuits of 100 or higher voltage or may be run in multiple from special transformers that can be designed for any existing circuits using alternating current.

Barring this question of low candle power high volt lamps,

it is seen that practically all the objections to the tungsten lamp resolve themselves into a question of cost or expense, and the skilful illuminating engineer will not require long to convince the large consumer of light that the saving in current at ordinary rates, as shown by reduced meter bills, will soon enable the tungsten lamp to pay for its initial cost, as well as for a considerable breakage, and the cost of all appliances incident to its introduction in place of the carbon lamp.

Of course it is possible, by careless handling of the tungsten lamp, to cause the excessive breakage to largely neutralize the saving in current effected by its high economy. The general public is so accustomed to rough handling of the carbon lamp, that it will take some length of time to educate them to the necessity of extreme care in handling the tungsten lamp. This, combined with its low cost, will leave a large field open to the carbon lamp for some time to come.

The superior efficiency of the tungsten lamp is due chiefly to the fact that the metal tungsten from which the filaments are made, is capable of standing a much higher temperature than carbon.

According to the law of Lummer and Kurlbaum, the light emitted by a glowing body increases as the 12th power of the absolute temperature for temperatures above 1900 degrees absolute. This is about the temperature of a carbon filament running at an efficiency of 4 watts per candle. The higher the temperature at which the filament is operated, the higher the percentage of total energy expended that is transformed into light as distinct from heat and other non-luminous radiation. In other words, at high temperatures, there is a larger proportion of the total radiation appearing in the visible spectrum than for the same glowing body at lower temperatures. This being the case, it is obviously desirable in the interest of economy to operate the incandescent lamp filament at the highest temperature consistent with the stability of the material composing the filament.

In the case of carbon, its increasing rate of deterioration with increasing temperatures is clearly shown by the following table, in which the "useful life" of the lamp is that which terminates when its candle power has declined to 80 per cent. of the initial.

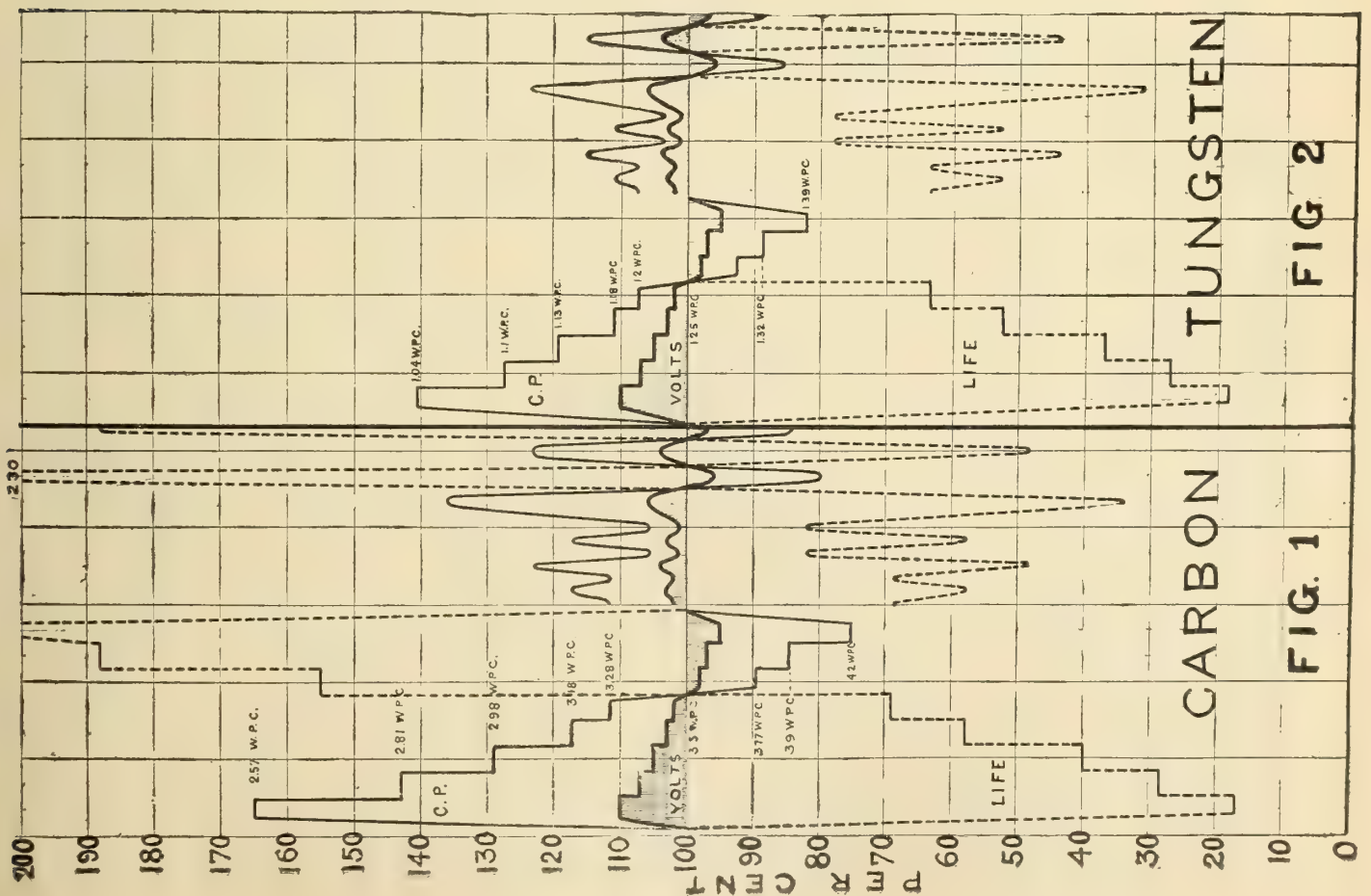
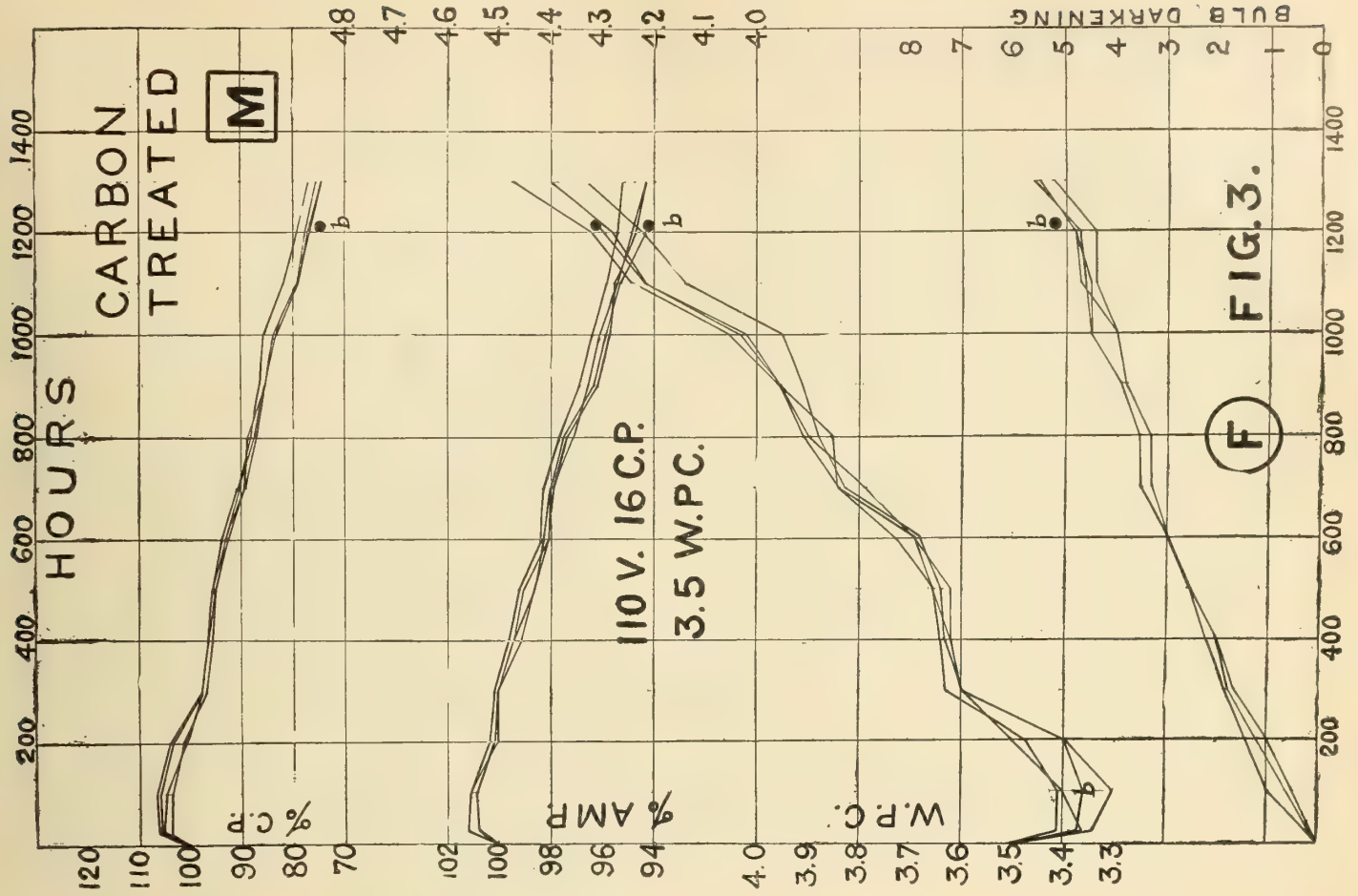
Efficiency in watts per candle	4.0	3.5	3.1	2.5	2.0
Useful life, in hours	2100	1050	500	143	37

It is thus seen that a carbon filament lamp having an efficiency of 4 watts per candle may be made to give just twice as much light for each watt of energy expended, or, in other words, take one-half as much energy to produce one candle, which result would be accomplished by running a 110-volt, 4 w.p.c. lamp at 136 volts—but by so doing the useful life is reduced 98 per cent., or from 2100 hours to 37 hours. It is obvious, then, that the ordinary carbon filament lamp is not at all suited to such a high efficiency as 2 watts per candle, its limit, for ordinary commercial purposes, being in the neighborhood of 3 watts per candle.

By subjecting the ordinary carbon filament to extremely high temperature, such as that of the electric arc, the carbon becomes transformed into graphite and is capable of standing considerably higher temperatures. By this means the "G.E. M.," or "metallized," carbon filament is produced which is suitable for running at an efficiency of 2.5 watts per candle, and will at this efficiency give as good life as the ordinary

\*Paper read before the Canadian Society of Civil Engineers.





carbon lamp at 3.1 watts per candle. This metallizing of the carbon adds to the cost of the lamp, and the consumer is likely to prefer a little additional expenditure for his lamps and secure the much higher efficiency of 1.25 watts per candle which he gets in the tungsten lamp. For this same reason he is likely—in most cases—to pass by the Tantalum metallic filament lamp with its efficiency of from 1.8 to 2.0 watts per candle, although with the ability of this tantalum lamp to stand rough handling and its adaptability to quite low candle powers at 110 volts, there is quite a field still open to it where direct current is used. One factory in Europe is at present turning out about 20,000 tantalum lamps per day. Its life on alternating current is only about one-half as great as on direct current, but still on A.C. a life of 600 hours or more is now claimed for it, while if left on the circuit undisturbed and free from jarring or vibration a much longer life than this can be gotten from the tantalum lamp even on alternating current circuits, particularly those of low frequency. The tungsten lamp, having the highest efficiency of any metallic filament incandescent lamp, has naturally attracted the most attention among the various new illuminants that have been placed upon the market within the last few years.

In order to test the claims made for this tungsten lamp by various interested parties, the writer started a life test about the middle of last year for the purpose of ascertaining:

1. The comparative behavior of various different makes of tungsten lamps under the most favorable conditions as to voltage regulation.

2. The relative behavior of the same make of tungsten, as well as of carbon lamps, under conditions of variable or fluctuating voltage, such as exists on most commercial lighting circuits as compared with their behavior on the well regulated voltage.

3. The effect of shades on the life and performance of tungsten lamps.

4. The effect of partial frosting of the bulb of tungsten lamps.

5. The effect of intermittent flashing of the tungsten lamp by turning on and off the current.

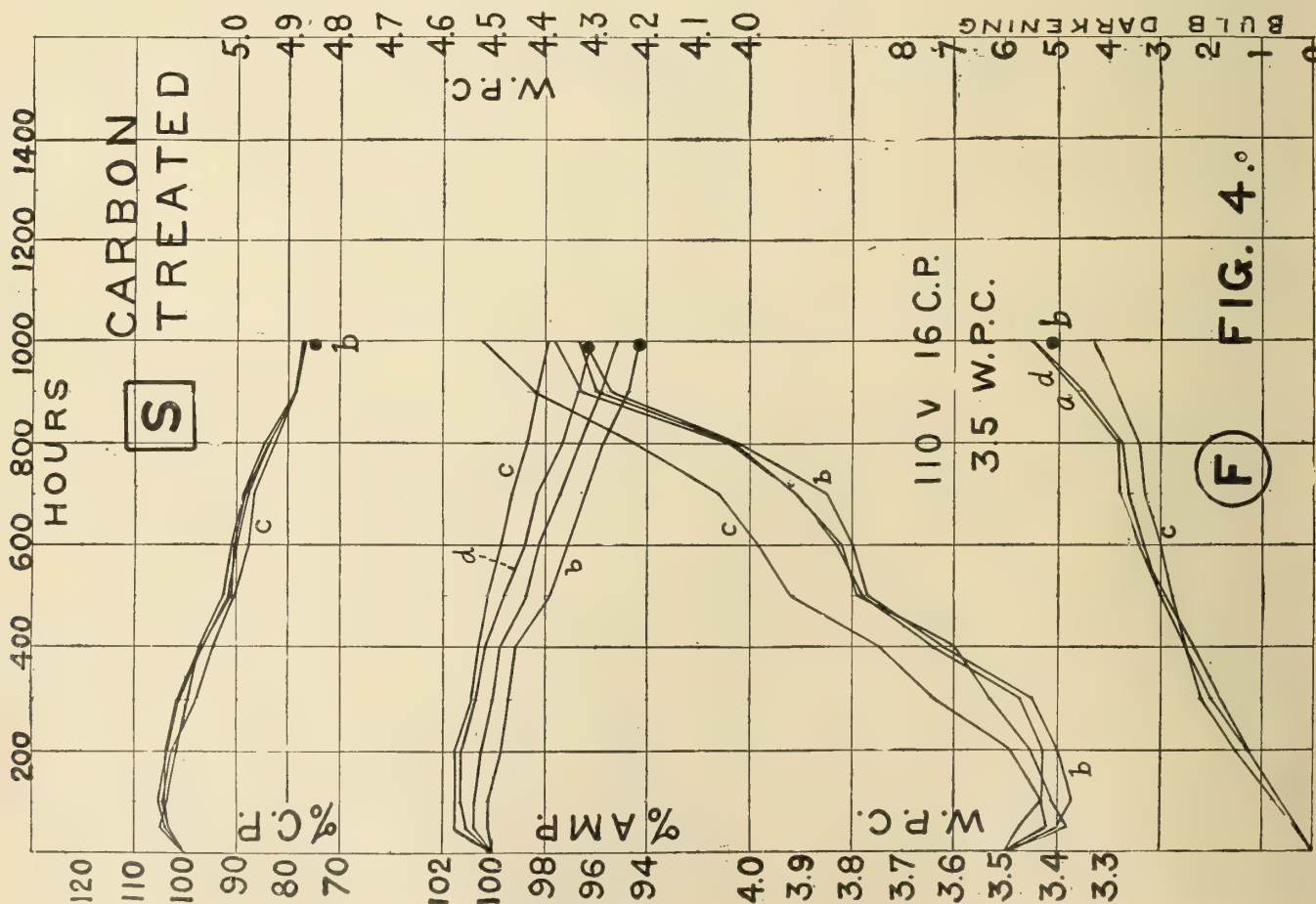
The results of these various tests are embodied in a series of charts which show clearly:

(a) The variation in candle power for approximately 100 hours, and in some cases a longer time, all given in percentage of the initial c.p. of each lamp.

(b) The variation in amperes for each lamp, given in percentage of the initial amperes. This, of course, indicates the variation in resistance of the filament and also is an index of the variation in consumption of power at different stages in the life of the lamp since all measurements throughout the life of each lamp were made at the same voltage, with the exception of fig. 51.

(c) The variation in efficiency, as expressed by watts per candle. The "candle" as here used is the British Parliamentary Spermaceti Standard, which is equivalent to 1.14 "Hefner" candles. In fig. 22 will be found a comparison between the two scales of efficiencies based upon these two candle standards.

(d) The variation in bulb darkening with hours of life. This refers to an arbitrary scale of incandescent lamps which the writer has used for several years to express the intensity of the darkening of bulbs. As all curves in the present tests—indicating the progressive darkening of the bulbs—refer to the same scale, they exhibit a correct comparison between the different lamps. These curves, embodying as they do all the important features and measurements that vary with the age of the lamps, present an accurate record of each lamp's behavior and quality with advancing age, and take the place of many words and figures. They will be readily comprehended with the aid of the brief description given on each chart of the significant features. The different manufacturers





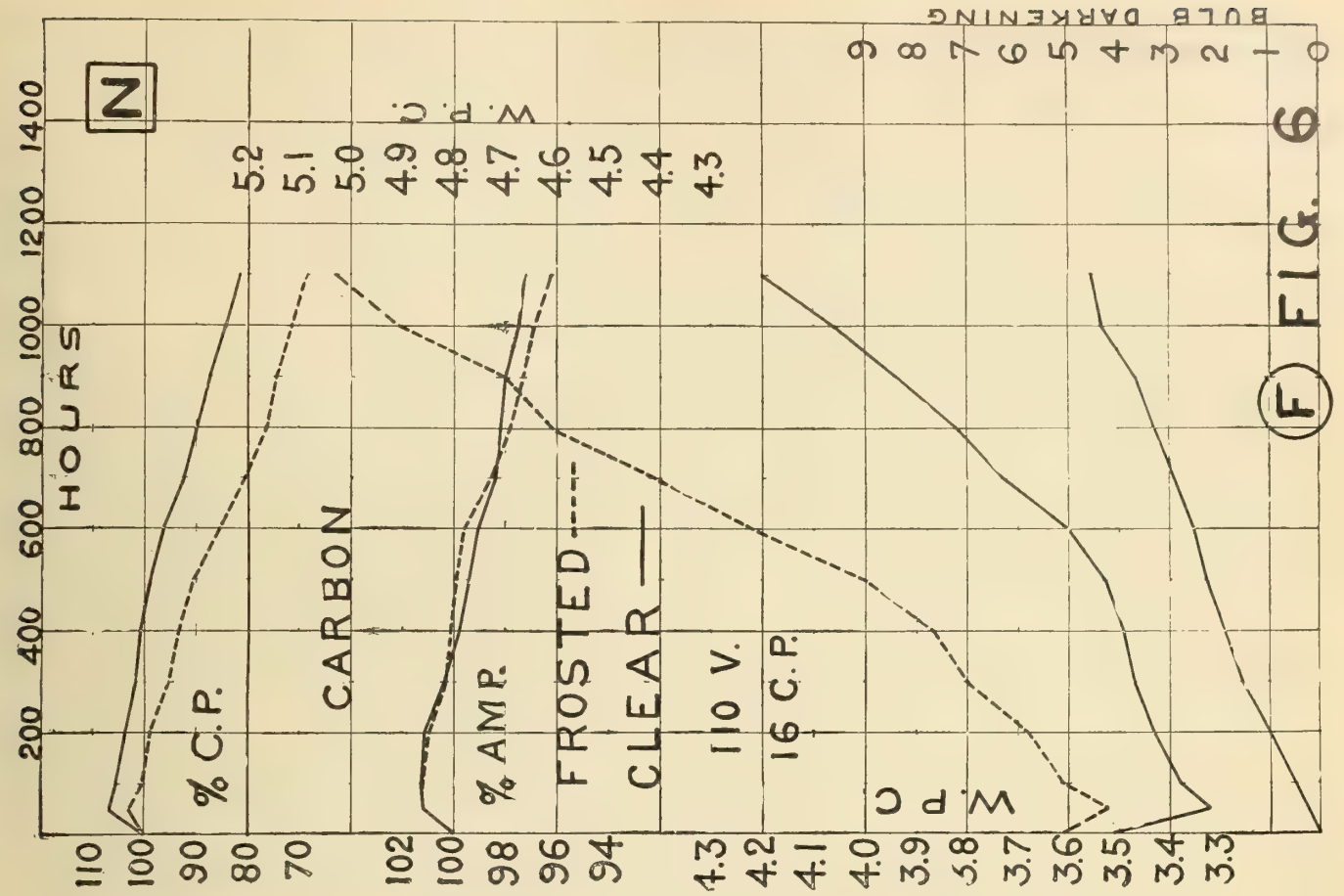
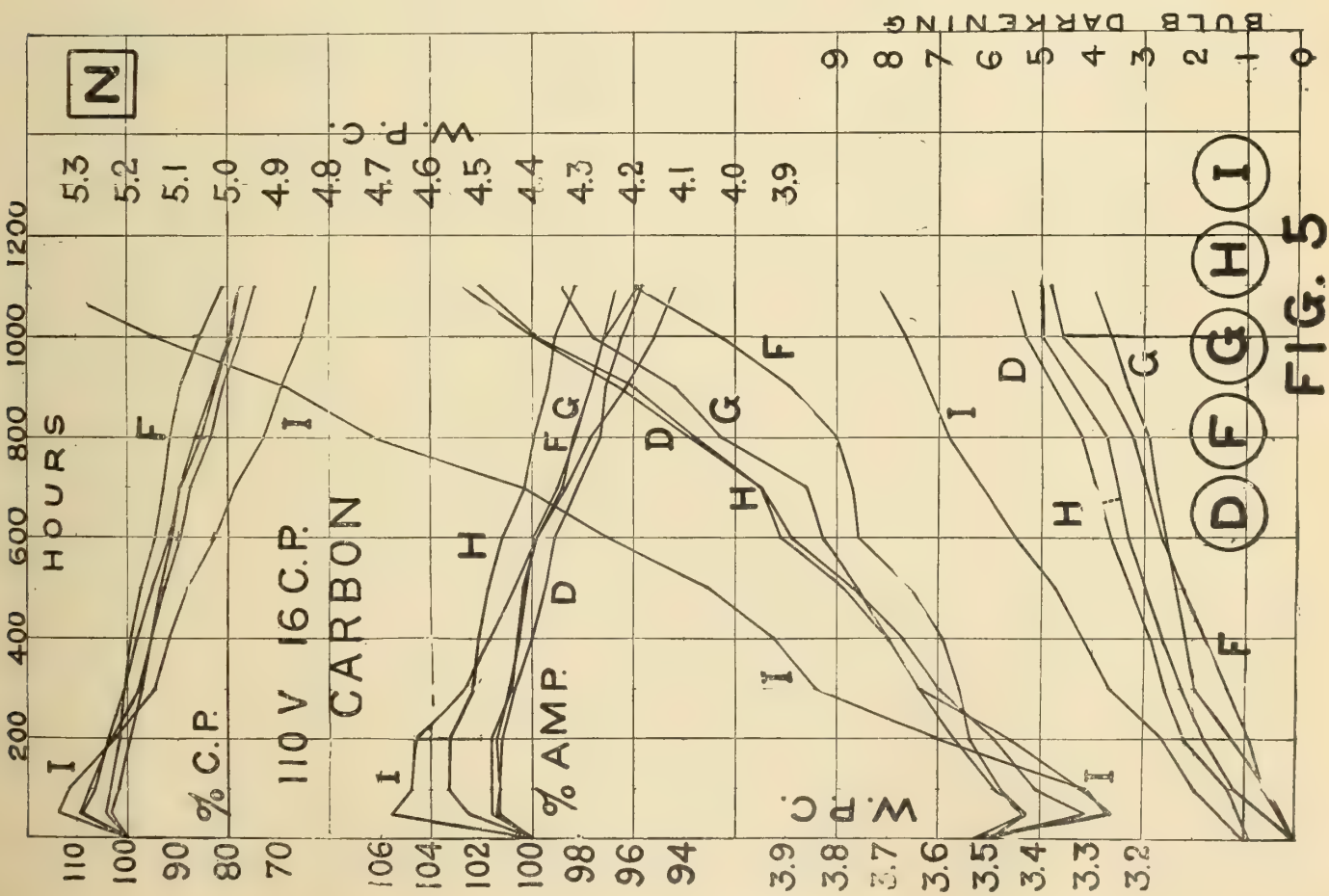


FIG. 5



of the lamps are represented by letters enclosed in circles and usually found at the bottom of the chart. All curves of any single make of lamps are always indicated by the same letter in circle. The different electrical circuits on which the tests were made are represented by different letters enclosed in squares and usually placed in the upper right hand corner of the chart.

The regulation, or variation in voltage, on these several circuits are indicated for each separate 100 hours of the test in fig. 10.

Circuit [M] is located in the meter department of the Canadian General Electric Peterborough works, and is used for testing and calibrating meters. The voltage is kept constant by means of a Tyrill voltage regulator, which keeps the voltage within  $\frac{1}{2}$ -volt of normal, which is 110 volts. In fig. 10 I have presented the extreme fluctuation as 0.3 v. above or below 110 volts with the average exactly 110 volts. Circuit [N] is located at the Canadian General Electric power house at Nassau, on the exciter generators. The variation in voltage after 6 p.m. at night when the lamps were burning has, I believe, not exceeded  $\frac{1}{2}$ -volt either way from normal, 110 volts, while the voltage has been kept as closely as possible at exactly 110 volts by means of a rheostat. Circuit [S] is located on the lamp works lighting mains, fed from a transformer, the power being obtained from the power house at Nassau, which supplies power to all departments of the works, so that owing to the variable load the voltage is very fluctuating, as shown in fig. 10.

While the lamps have been on test, readings of the volt meter have been made and recorded every 10 or 15 minutes. On the chart every dot represents a reading, and all the readings for seven representative days are here recorded for each hundred hours, so that these dots represent about 70 per cent. of all the readings recorded. Circuit [T] is on a transformer used for testing incandescent lamps of 200 to 260 volts. The power is supplied by the water wheels at Nassau. The readings of voltage on this circuit were made in the same manner as on circuit [S], and whenever the voltage was discovered high or low it was brought back to about 222, or between 220 and 225 volts, but only the higher or lower voltage recorded. Since, when the voltage was found between 220 and 225 no change was made in the rheostat, these readings near 220 and 225 each represent on the average a full period of about 15 minutes, while the high and low readings each represent about one-half such period, because the high and low readings were always corrected as soon as discovered. The average voltage on this circuit [T], then, would be more correctly represented if the dots in the vicinity of 220 and 225 volts were about doubled in number. This last remark applies, for the same reason, to the dots close to 110 volts in circuit [S] for the first 700 hours, when an attempt was made, as the dots show, to keep the average voltage as close as possible to 110. After the first 100 hours, circuit [S], the voltage was intentionally kept most of the time at about 112 volts or above, as shown clearly by the dots, in order to see what effect this would have on the lamps. At the same time the voltage, if between 112 and 114, was left as found, and not brought back to normal unless found to be above 114 volts.

Most tests of tungsten lamps that have been reported by individuals interested in particular makes of lamps have shown phenomenally long life for the tungsten lamp, when its extremely high efficiency is considered. Such tests are interesting as showing what is possible provided the tests are conducted in a scientific manner, but the results can not be accepted as an average for commercial lamps, as unsatisfactory tests by interested parties do not find their way into the papers. Most tests of lamps on ordinary commercial circuits are of little value, as information is lacking as to variation in voltage, and also the average voltage, which are of paramount importance in any lamp test. Furthermore, most ordinary commercial tests should be viewed with suspicion be-

cause the instruments have not been checked for accuracy and the photometric tests have not been properly conducted. In the tests here exhibited, nothing but ordinary commercial lamps have been used, and the results are shown for all the lamps that were started in each lot, the poor lamps as well as the good lamps, so that these figures will give an idea of the general run of tungsten lamps, as well as of carbon, in the middle of 1908, when the test was started. Five different manufacturers of tungsten lamps, all from Europe and the United States are here represented. And five different makers of carbon lamps, representing Europe, United States and Canada.

Figures 1 and 2, on one chart, are designed to show the effect of varying voltage on the candle power and also on the life of the lamp, fig. 1 being for the ordinary carbon power and also on the life of the lamp, fig. 1 being for the ordinary carbon lamp and fig. 2 for tungsten. The shaded portion of the figures in the centre of the chart represents variation of voltage above and below normal, and is exactly the same in fig. 1 as in fig. 2, in order to afford a comparison between the carbon and the tungsten lamps. The solid line curves represent variations in candle power corresponding to the variations in voltage as shown. The dotted line curves represent variations in life corresponding to the given variation in voltage. The left hand portion of each figure is arranged in well-defined steps representing a rise in voltage or 2, 3, 5, 7 and 10 per cent. above normal, and 2, 3 and 5 per cent. below normal. The right hand portion of each figure represents the fluctuation in voltage, such as is found on ordinary commercial circuits, and is here represented as varying from six per cent. high to four per cent. low. It would not be difficult to find circuits on which the variation exceeds this. It will be observed that a ten per cent. increase in voltage raises the c.p. of the carbon lamp by 65 per cent., and of the tungsten lamp by 40 per cent. While this same 10 per cent. increase in voltage reduces the life of the carbon lamp to 17 per cent. of normal and of the tungsten lamp to 19 per cent. of normal. The normal, in the case of carbon, being that voltage at which the efficiency is 3.5 watts per candle, and in the case of tungsten that voltage at which the efficiency is 1.25 watts per candle.

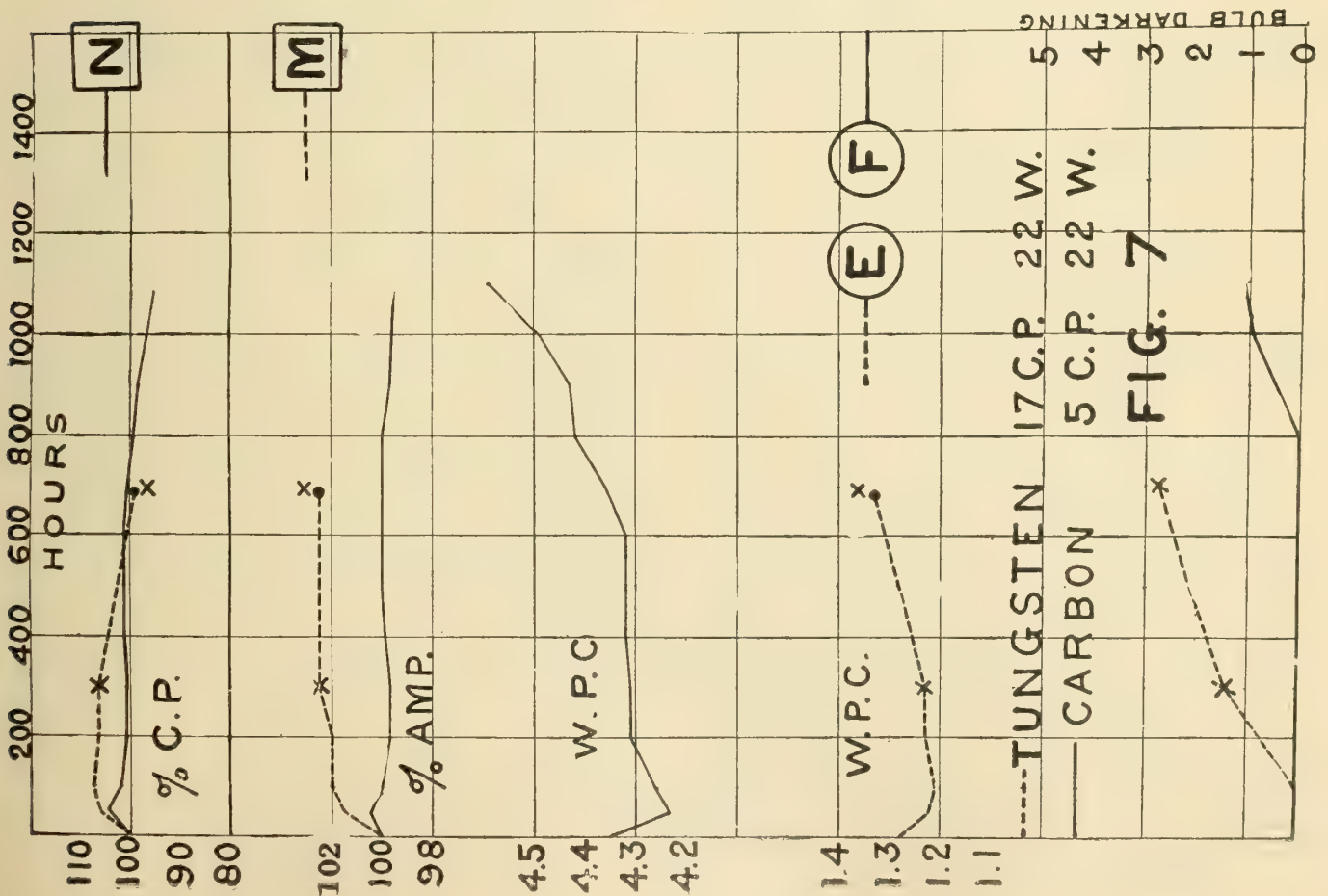
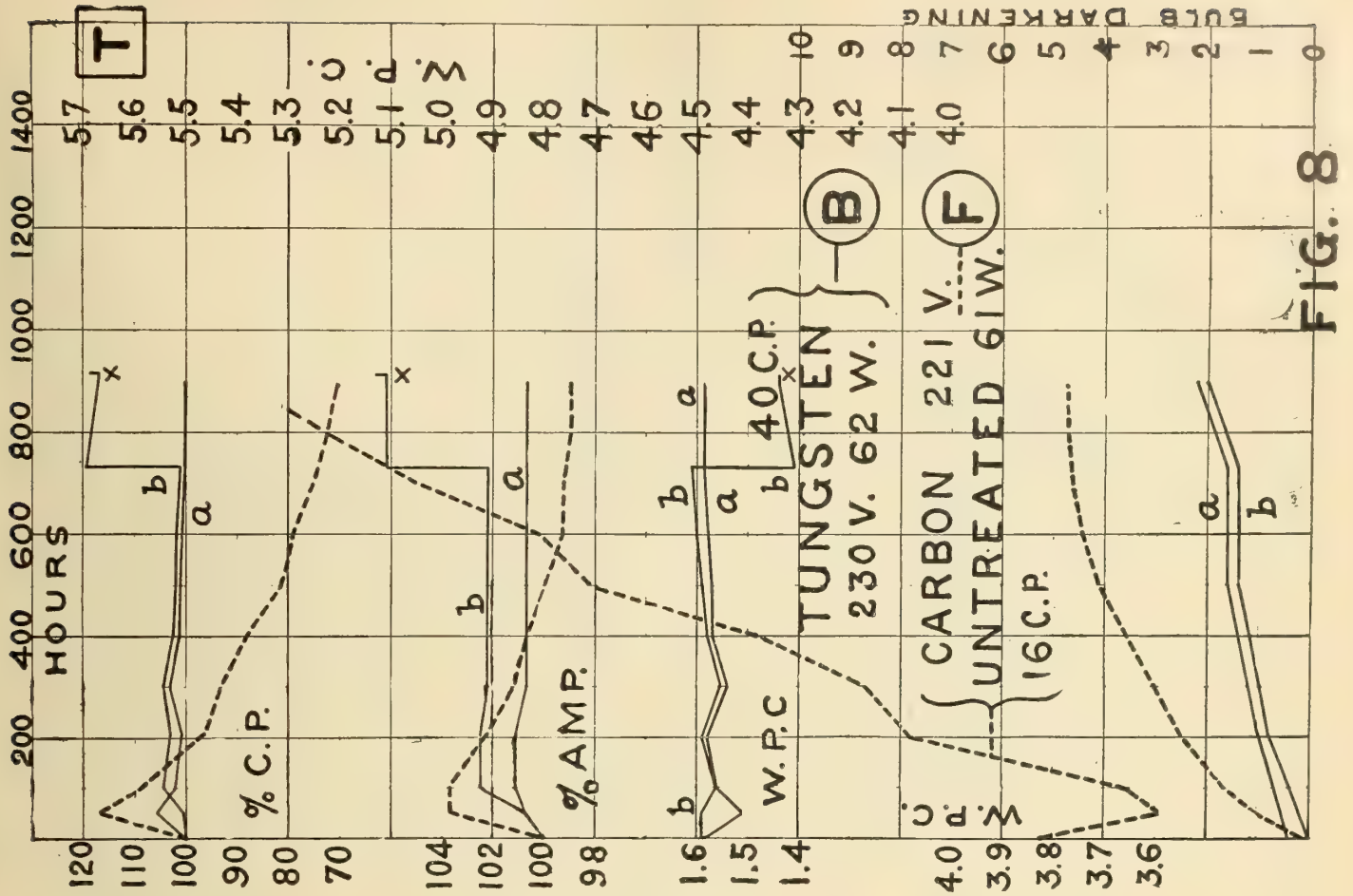
The variation in life of the tungsten with variation in voltage is derived from figures published in a paper by Remane, an engineer of the "Osram" Lamp Works, and it represents the rates of decline in candle power at various efficiencies as compared with the rate of decline at normal efficiency, 1.25 w.p.c., or 1.1 watts per Hefner candle, that is, after the lamps have passed the first few hours of their lives and the c.p. curves have assumed a uniform rate of decline for each efficiency. Figures 1 and 2 show clearly how very important the question of voltage is in connection with life tests of incandescent lamps, whether carbon or tungsten.

The question of variation in life with variation in efficiency is one in which reliable data can be obtained only by the test of a large number of lamps. I am not informed as to the extent of the tests of tungsten lamps that afforded the data on life in fig. 2 and have been unable to confirm these particular results from other sources.

As to the effect on life of the tungsten lamp, by running it at lower voltage than its rated voltage, or at lower efficiency, I have no data and therefore have been unable to insert the life curves in the upper part of fig. 2. The curves of life in fig. 1 relating to carbon lamps are based upon well established data derived at the Lamp Works of the General Electrical Company, from a large number of lamps. All the charts here shown refer to tests of tungsten lamps excepting those marked carbon. It has not been considered necessary to insert the word tungsten, since additional writing tends to interfere with the distinctness of the curves.

Symbols use: "V" indicates volts; "W," watts; "W.P.C.," watts per candle (English Parliamentary); "Amp.," am-





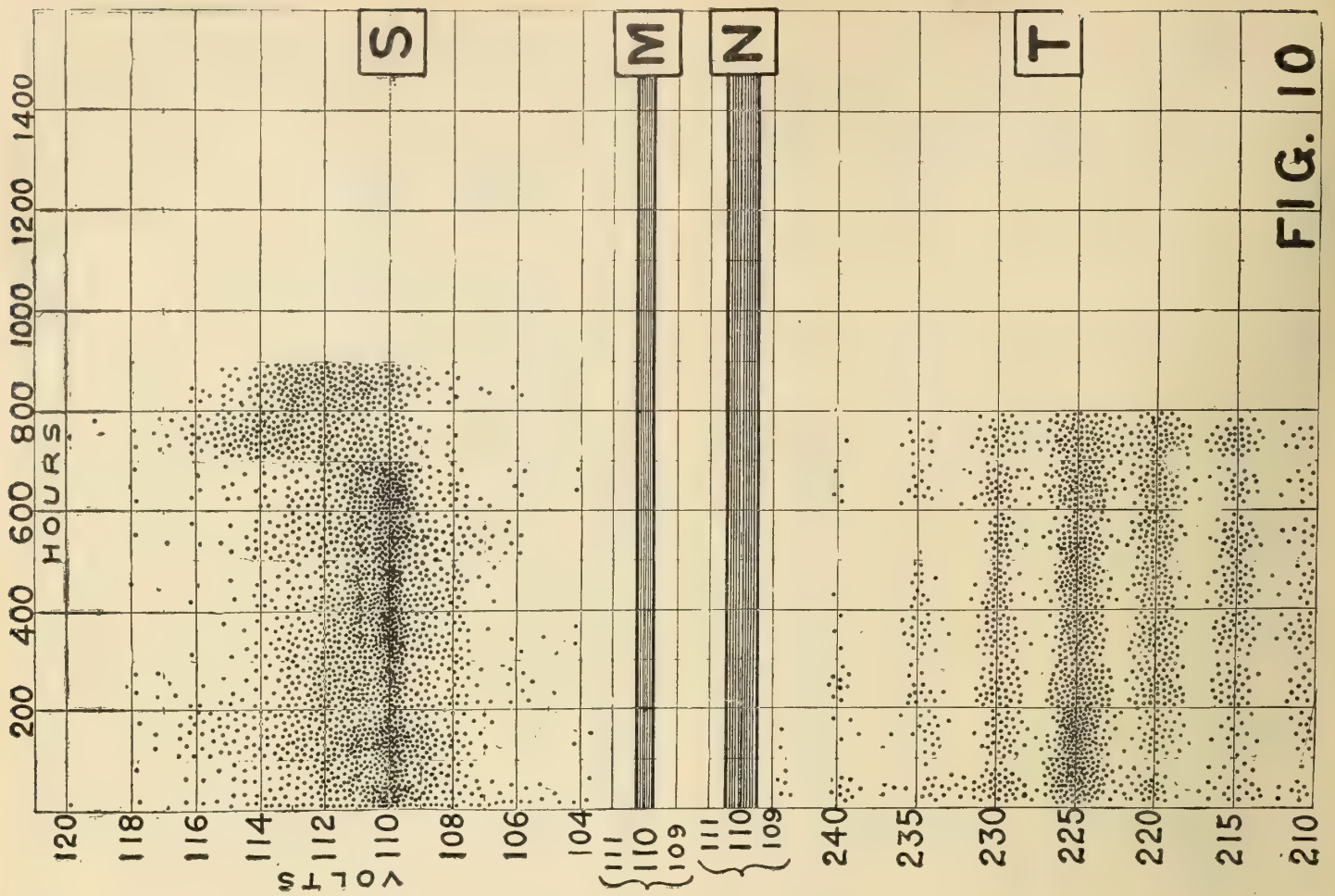
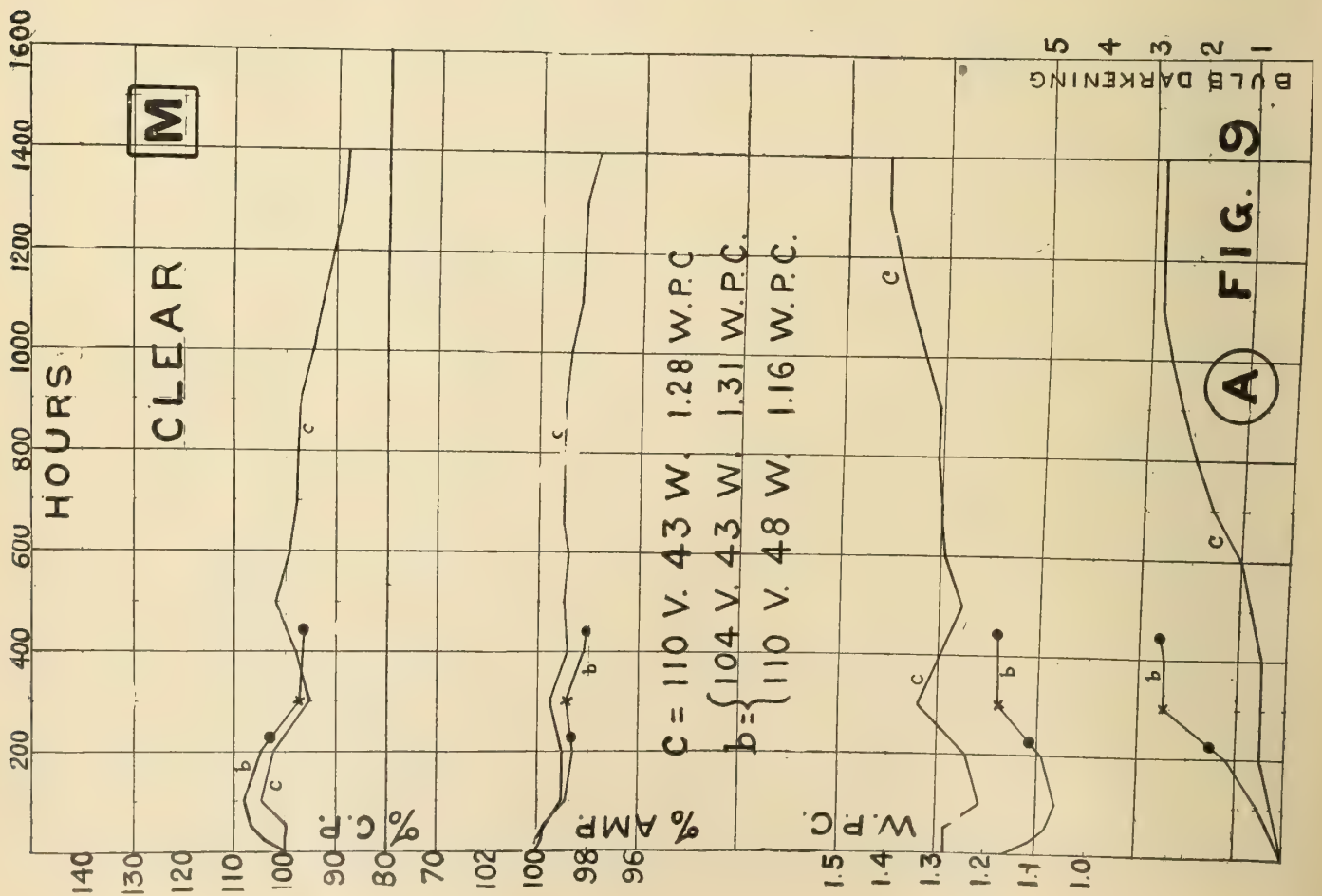


FIG. 10



A FIG. 9

B.C.L.B. DARKENING



peres. The small letters near the curves refer each to a particular lamp and enable the reader to compare the different lamps of any lot as to their performance in C.P., amperes, W.P.C., and darkening of bulb. This study will be found highly interesting and instructive. As the curves are all carefully drawn to scale, the exact percentages for any lamp at any point can be obtained by estimating the positions between the lines. The student must, however, be cautioned against drawing general conclusions from a single lamp, or from two or three lamps. Incandescent lamps often execute freak performances which are very difficult to explain, and which are often apparently at variance with well established laws. The incandescent lamp is highly sensitive to influences of microscopic dimensions. As an example, note lamp C in fig. 13, which is well above the other three lamps in c.p. for the first 200 hours, and at 300 hours is below them all, and thereafter progresses parallel to the others as if that had been its position from the start. A full appreciation of the tungsten lamps will be better obtained by a preliminary and comparative study of the carbon lamp. Figures 3, 4, 5, 6, 7 and 8 are placed together so that you may observe the general features of the carbon lamp. Figures 3 to 6 are all carbon lamps of 3.5 W.P.C. efficiency, which is now the standard in Canada for lamps of 16 and higher c.p. They all represent lamps having good reputation as first class, excepting make (I) in fig. 5, which is introduced simply to show that after 29 years of progress in lamp manufacture, there is still a considerable difference between different makes of the ordinary carbon filament lamp. Fig. 5 shows the average curves only of five different makes. All the lots, you observe, start with the same efficiency, which is the most important factor in deciding performances on life tests. Although all start at 3.5 W.P.C., they vary from 4.03 to 5.14 W.P.C. after 1,000 hours—a difference of 27 per cent. Barring (I), you observe quite a uniformity in the bulb darkening, which at 1,000 hours averages about 4.5.

The general features common to all the carbon filament lamps is the comparatively rapid decline in candle power and the rapid rise in the W.P.C. curves. These are the two most important curves. The ampere curves also decline more rapidly than in the case of the tungsten lamps, notwithstanding the much higher temperature of the latter, indicating a steady change in resistance of the carbon. Whereas some tungsten lamps burn long periods of time with no changes whatever in their resistance. Note in this connection lamp C in fig. 9, which took 97.8 per cent. of its initial current after 1,400 hours' burning. Note also all the lamps in fig. 11, and lamp B in fig. 12, which took exactly the same amperes from 50 to 1,000 hours, although this lamp ran during this time on the fluctuating circuit [S].

The best carbon lamps of 3.5 W.P.C. efficiency decline in c.p. to 80 per cent. of their initial c.p. in from 900 to 1,200 hours on a circuit such as [M]. Observe in comparison the various tungsten lamps. Lamp c in fig. 9, started at 33.6 c.p. and gave 31.7 c.p., or 94.4 per cent. of the initial after burning 1,000 hours, and 29.6 c.p., or 88 per cent. of the initial after burning 1,400 hours. Lamp b in fig. 11, although starting out with a broken filament, reached 1,000 hours with 92.7 per cent. of its initial c.p., and is apparently good for many more hours. Lamp a, fig. 8, starting at 1.58 W.P.C., reached 900 hours on a 225-volt circuit, [T], with 100 per cent. of its initial c.p., and an efficiency of 1.59 W.P.C., as compared with 1.58 W.P.C. initial. It is to be noted, however, that this lamp ran on the average below its rated voltage (230) and started with a poor efficiency as compared with the average tungsten lamp of 110-volts.

An inspection of the various curves indicates that those tungsten lamps of good make which do not show defects in manufacture reach or pass 1,000 hours' life without declining to 80 per cent. of their initial c.p., when starting at an initial efficiency of from 1.25 to 1.4 W.P.C. This is a better per-

formance than can be expected from most carbon filament lamps starting at 3.5 W.P.C.

Mr. Burnett's paper will be continued in our June issue. Mention will be made of several charts used in this number, and it should be preserved for reference.—The Editor.

## Plant Extension at Edmonton

The progression of western Canadian cities towards obtaining efficient and up-to-date electrical systems is exemplified in the city of Edmonton, Alta. Their municipal plant is undergoing extensive alterations and being reinforced by new equipment that will make their power house very complete. The new machinery is practically all being supplied by Canadian firms and is under contract to be installed by July, 1909. The following list of their present equipment and contemplated changes will furnish an idea of the size of this plant:

Generators now in operation—One 225 k.w. 2,300 volts, manufactured by Allis-Chalmers-Bullock; one 450 k.w. 2,300 volts, manufactured by Allis-Chalmers-Bullock; one 750 k.w. 2,300 volts, manufactured by Allis-Chalmers-Bullock; one motor generator set, 250 k.w., 550 volts, manufactured by Canadian General Electric Company.

Engines now in operation—One 300 h.p. Robb-Armstrong; one 600 h.p. Robb-Armstrong; one 1,200 gas engine and producer plant, manufactured by Allis-Chalmers-Bullock; one gas producer, manufactured by Loomis-Pettibone.

Pumping Station—One electric turbine pump, capacity 3,000,000 gallons, manufactured by Mather & Platt, Manchester, Eng.; one pump, capacity 1,500,000, manufactured by John Inglis; one pump, capacity 1,000,000 gallons, manufactured by the Northern Company.

Boilers.—Two Robb-Mumford boilers, 150 h.p. each; three Babcock-Wilcox boilers, 300 h.p. each.

New installation.—Generators: One 1,500 k.w., 2,300 volts, manufactured by Canadian General Electric Company; one 300 k.w., 550 volts, manufactured by Canadian Westinghouse Company; two 300 k.w., 550 volts, manufactured by Crocker-Wheeler Company.

New engines to be installed before July 1909: One 1,800 h.p., manufactured by Goldie & McCulloch; one 600 h.p., vertical type engine, manufactured by Robb-Armstrong; two 600 h.p., vertical type engines, manufactured by Bellis-Morecom, London, England.

New pump now under contract: One pump, capacity 600,000 gallons, manufactured by John Inglis Company, Toronto. All water supplied the city is filtered with the Roberts Filtration System, of Philadelphia.

New boilers contracted for, to be installed before July, 1909: Eight Babcock-Wilcox, 400 h.p. each.

## Quebec Electrical Contractors' Meeting

The Electrical Association of the Province of Quebec held their March meeting in the Inglis Building, St. Catherine street, Montreal. Mr. J. Bennett, Chief Electrical Inspector Canadian Fire Underwriters' Association, gave an interesting talk on "Wiring of Moving Picture Shows." Mr. Orchard, of Messrs. Ormsby Company, Toronto, manufacturers of cabinets for moving picture shows, exhibited a miniature and explained its special features. The balance of the evening was given up to a pleasant smoker. President E. W. Sayer expressed his thanks to the executive committee for their excellent work in securing 17 new members, also to the entertainment committee and those who had assisted in the programme.



## Power Plant Construction

### A 22-Mile Transmission

The new power house of the Seymour Power & Electric Company, Limited, at Campbellford, Ont., is practically completed and the new machinery will shortly be installed. Two 600 k.w. 60-cycle, three-phase, 2,400-volt generators are being built at the Canadian General Electric works at Peterborough, and two 900 k.w. transformers are being supplied by the Canadian Westinghouse, and with these the voltage will be stepped up to a transmission voltage of 44,000, and carried a distance of 22 miles to Deloro, where an initial contract for 500 h.p. has been obtained from the Deloro Mining & Smelting Company. The water-wheels for the power house are being made in Owen Sound by William Kennedy & Company, and are of the 150-revolution vertical shaft type, with two runners to each wheel. The switching equipment, including panel boards, lightning arresters, etc., are being supplied by the Canadian General Electric Company.

In designing the transmission equipment Messrs. Smith, Kerry & Chace, consulting engineers for the company, have decided to use No. 2 stranded aluminum wire. Provision has been made by the designers for a much larger equipment than is at present the intention of installing, and when fully completed the power house will contain five 600-k.w. generators and four 900-k.w. transformers of the same type as those now being installed, and two 75-k.w. exciters.

### New Electrical Equipment at Ottawa

We understand from Mr. A. A. Dion, general superintendent of the Ottawa Electric Company, that the coming summer will witness many important changes in the equipment of the company. At present the company are obtaining their output from three power houses, their main generating station is operated by water power obtained from the Ottawa river, while an auxiliary water power plant is installed in a separate building; a steam plant is always in readiness for emergencies and also carries the peak loads during the period of low water. It is to the auxiliary station that special attention will be devoted this year, and it will be thoroughly remodelled. It has never furnished the best service possible, since all the available head of water at that point has not been utilized, nor has the machinery been of the most efficient kind. The present head of 22 feet will be augmented and a head of 33 feet will be obtained, and with higher efficiency generators and water-wheels a much larger output will be the result.

It is proposed to install two 2,300-volt alternating current generators with a capacity of 1,300 k.w. each. They will be two-phase, 60-cycle, slow speed machines and will operate at 180 revolutions, and each be driven by a pair of S. Morgan Smith horizontal turbines 48-inch in diameter with speed governed by Lombard type "N" governors. Two 110 k.w. exciters will be installed. One will be direct connected to a water-wheel and the other direct connected to an induction motor. The exciters are made large in order to take care of additional units which may be placed in the station if the water conditions show that it is advisable.

In the central station, where three 750 k.w. units are now installed, there will be a fourth generator, driven by three 39-inch Victor water wheels on a single shaft.

The machinery is all being installed under the supervision of the company's own officials. The new building will be of concrete and steel and entirely fireproof, as are the other two power houses.

These improvements have been made advisable by the construction of the new dam above the Chaudiere Falls, which has already given good results, and the scheme of storing the water of the river in its upper reaches which has been inaugurated by the Dominion Government will undoubtedly produce in the course of a couple of years a marked improvement in the low water conditions of the Ottawa river. The electrical business in this city is divided between the Ottawa Electric Company and a municipal company, but the management of the Ottawa Electric Company find their business increasing largely, hence provision has been made for additional power as required from time to time.

The management of the company report that a Westinghouse-Parsons steam turbine, which they have in operation, has been the salvation of their service on several occasions. The extremely low condition of water existing last October and November would have made it impossible to pull through but for the splendid service obtained from this turbine, which carried during the peak loads as high as 60 per cent. above its normal rating.

### Meetings and Conventions

Canadian Electrical Association annual convention at Quebec, June 16th, 17th, 18th, 1909.

Annual meeting Canadian Manufacturers' Association, Hamilton, Sept. 14th, 15th and 16th, 1909.

Annual convention American Institute of Electrical Engineers, June 28th, 1909, at Hotel Frontenac, Thousand Islands, Frontenac, N.Y.

National Electrical Contractors' Association of the United States. Secretary, W. H. Morton, 41 Martin Building, Utica, N.Y. Next meeting, Toledo, Ohio, July 21, 1909.

National Electrical Trades Association. Secretary, Fred P. Vose, 1343 Marquette Building, Chicago. Next meeting, Boston, Mass., June 10, 1909.

Nova Scotia Society of Engineers, Halifax, May 13th; Secretary, S. Fenn.

National Electric Light Association annual convention, Atlantic City, N.J., June 1st to 4th.

American Association of Electric Motor Manufacturers. Annual meeting at Hot Springs, Va., on May 18th, 19th and 20th.

American Electro-chemical Society. Next meeting, Niagara Falls, Ont., May 6-8.

### Canadian Wireless Systems

Expensive operation of Canadian telegraph systems, especially in the Yukon and northern British Columbia, due to damage to lines from snow slides, rock slides and blizzards, may bring about the installation of wireless systems where wire troubles are most prevalent. Last year's receipts were \$122,432.53, compared with an expense account of \$386,567.34.

A movement is on foot among members of the Canadian Manufacturers' Association to persuade the Ontario Government to do away with juries in Division Court cases. It is held that in cases in which farmers are the defendants the local feeling is often so strong that verdicts given for the defendants are plainly unjust.



## Publications Received

The Hamilton Anchor Company, Limited, of Hamilton, have issued an attractive booklet, illustrative of their Swan anchor.

The Westinghouse Electric & Manufacturing Company have issued booklet No. 6, on Textile Motor Talks. Booklet No. 4, on Motor Talks, contains a useful table for finding the current in a three-phase circuit.

"Reactions" for the first quarter 1909, has been issued by the Goldschmidt Thermit Company, New York, and gives interesting suggestions for the use of Thermit in repair work.

The Westinghouse Electric & Manufacturing Company have issued circular No. 1160, dealing with multiple tungsten lamps, and Circular No. 1164, dealing with mill motors.

A paper read by R. G. Dukes before the American Society of Mechanical Engineers, on tests of friction clutches for power transmission, has been issued in booklet form by the Hill Clutch Company, of Cleveland.

An attractive booklet on the Gould Battery in Isolated Lighting Plants, has been issued by the Gould Storage Battery Company, Depew, N.Y., and contains much information of value to electrical engineers and central station men.

The Willard Storage Battery Company, of Cleveland, Ohio, manufacturers of Elba electric batteries and tungsten lamps for searchlight and automobile service, have placed their Canadian agency with Mr. Herbert Kingsland, Graham Building, Ottawa.

Bulletins 12 to 15, covering bushings and pipe clamps, have been issued by the H. K. Krantz Manufacturing Company, Brooklyn, N.Y., and can be obtained on application to the C. H. L. Keeler Company, 511 Continental Building, Toronto, Ont.

An interesting folder descriptive of their "Norwich" crane motor, with new brake attachment, has been issued by Laurence, Scott & Company, Limited. Mr. J. F. B. Vandeleur, 3 Dineen Building, Toronto, is their Canadian agent.

Verity's, Limited, 32 King street, Covent Garden, London, W.C., have issued a catalogue on "Aston" (tungsten) Lamps, also transformers and balancers for operating their low candle-power lamps. Bulletin X102 contains a price list of electrical supplies, lighting fixtures, direct connected lighting outfits, etc.

We understand that the Electrical Maintenance & Repairs Company, 162 Adelaide street west, Toronto, are extremely busy for this season. Their work is confined chiefly to motor and dynamo repairs, which they can handle with great rapidity with their modern equipment.

The Penberthy Injector Company, Limited, Windsor, Ont., have just gotten out a handsome watchfob, and will mail one free of charge to any engineer mailing in his name and address to them and enclosing 15 cents in stamps or coin to cover postage and packing. The number to be given out is limited. Address your letter, Dept. D, Penberthy Injector Company, Windsor.

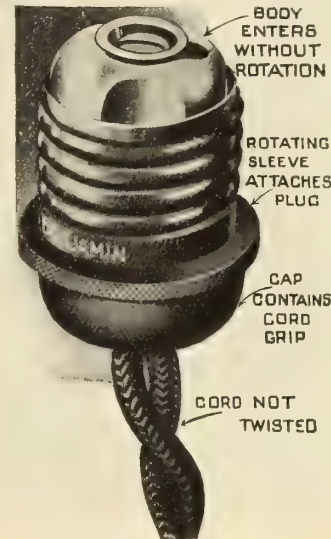
It is understood that the Ottawa Electric Railway are preparing to equip their system with "pay-as-you-enter" cars.

## A New Book

Electric Lamps, by Maurice Solomon, A.C.G.I., A. M.I.E.E. Copp Clark Company, Limited. Price, \$1.80. In this book Mr. Solomon has traced the development of the commercial electric lamps, and has dealt with the modern forms. The fact that tables showing the respective cost of operation of the various lamps are given makes it a valuable volume.

## Useful Attachment Plug

The Benjamin Electric Manufacturing Company have in their new attachment plug one that overcomes many of the disadvantages of the ordinary screw plug. The addition of a rotating sleeve which enables a connection



Benjamin Electric Plug.

to be made without twisting the cord and a new cord grip are the strong points of this neat and convenient attachment plug. It is standardized by the National Electrical Code.

## A. I. E. E. Convention

At the coming convention of the American Institute of Electrical Engineers, the following are among the list of topics up for discussion:

"Split-Pole Converters and Storage Battery Regulation at Gary, Ind.," by J. L. Woodbridge; "The Reduction in Capacity of Induction Motors Due to Unbalancing in Voltage," by S. B. Chartres and W. A. Hillebrand; "The Heating of Induction Motors," by Alexander M. Gray; "Generators for 100,000 Cycles," by E. F. Alexander. There will also be three-power papers by D. B. Rushmore.

## Simmen System in Operation

On Saturday, April 17th, the Engineer's Club of Toronto visited the Sunnyside station of the York Radial Railway Company and inspected the Simmen railway signal system. Mr. A. Moore took charge of the party and gave a concise description of the operations. A trip was made on a radial car to Long Branch and the actual operation of the system observed by the club's members. The Simmens' system was described in the January "Electrical News."

## The C. H. L. Keeler Company

In the recent establishment of the firm of the C. H. L. Keeler Company, the electrical fraternity will have an opportunity to meet two representative electrical men. Mr. C. H. L. Keeler was well known as secretary of the C. W. Bongard Company, Limited, with which firm he has been connected for many years. Having severed his connection with that firm he has entered into partnership with Mr. J. A. Johnston, formerly eastern representative of the C. W. Bongard Company, Limited, and



Mr. C. H. L. Keeler.

they are established in business as manufacturers' agents at 511 Continental Life Building, Toronto.

The new firm are Canadian agents for the H. Krantz Manufacturing Company, of Brooklyn, N.Y., whose panel and switchboard work has made a good reputation in the United States, and are found in some of New York's best apartments. The following are well known buildings where Krantz panels are installed:

Hotel St. Regis, R. H. Macey & Company's building, Gould residence, Lyceum Theatre, Manhattan Hotel, Columbia College, Tiffany & Company's building, Madison Square Presbyterian Church, Metropolitan Life building, New York; Carnegie Institute, Pittsburg, Pa.; the White House, Washington, D.C.; Baltimore & Ohio Building, Baltimore, and many other provincial buildings.

The C. H. L. Keeler Company also represent the Duncan Electric Company, Lafayette, Mich., makers of transformers and meters; C. J. Toerring Company, Philadelphia, makers of the Toerring arc lamp, and the Woolley Electric Company's enclosed fuses.

## Established New Department

The Toronto Electrical Maintenance Company, 24 Adelaide street west, Toronto, have established special departments for the inspection of power plants and electric light installations. They are prepared to submit estimates and furnish expert advice showing how a saving of 25 per cent. on electric light charges may be effected. Special attention will be given to the maintenance of power plants, which will be inspected periodically,

at a minimum rate, by contract. The company have installed modern electrically-driven machinery for repair work and are thereby enabled to handle their contracts with satisfaction and dispatch. The management has been entrusted to Mr. T. W. Sheffield, A.M. I.E.E., a gentleman of extended experience in connection with electrical undertakings. For five years Mr. Sheffield was district manager for one of the largest branches in Great Britain of the General Electric Company of New York. Mr. W. H. Jackson, of Toronto, who is well versed in the economical up-keep of power plants and lighting services, has been engaged as engineer.

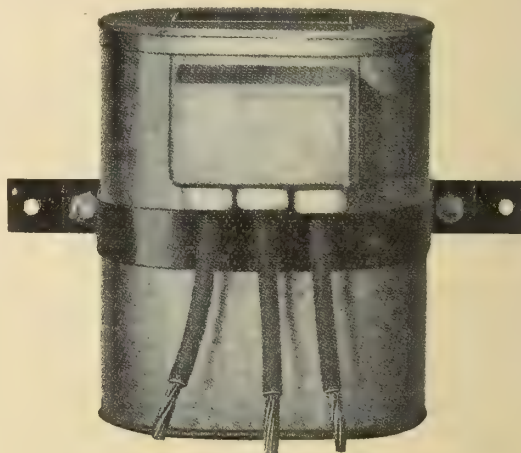
## A Special Transformer

One of the most interesting applications of the tungsten lamp is their use on electric signs. The operation of a sign with a carbon filament lamp is reduced to a minimum cost by the use of 4 c.p. lamps, operated from the regular 110-volt circuit. It is, of course, impossible to make a tungsten lamp of such low candle-power to operate on that pressure as the filament is too fragile, but a tungsten lamp of 4 c.p. operating at a terminal pressure of 10 volts has a very substantial and rugged filament, which is not easily damaged by vibration or rough handling.

Such lamps could be used in series on 110 volts, but there would be the objection of losing the entire series if one burnt out, and also, except in the case of a new installation, having to rewire the entire sign.

The obvious method, therefore, of taking advantage of the tungsten lamp is to install a transformer in the circuit to step down from the existing pressure to the low voltage required by the tungsten lamp.

The Enterprise Electric Company, of Warren, Ohio, have recently developed a line of transformers for this



The "Peerless" Transformer.

very purpose. They are made in four convenient sizes of  $\frac{1}{8}$ ,  $\frac{1}{2}$ ,  $\frac{2}{3}$  and 1 k.w. They are very light in weight and can be attached to almost any kind of sign without looking conspicuous.

Since this transformer has been placed on the market the company states that the demand for the same has been unprecedented, and are confident that the transformer will have an important bearing on the future of the electric sign business. Mr. A. H. W. Joyner, 6 Wellington street east, Toronto, is their Canadian agent.

The commercial travellers' tax in Prince Edward Island has been abolished.



# Current News and Notes

## **Aberdeen, Sask.**

The farmers east of here have organized a telephone company to be known as the Aberdeen Valley Rural Telephone Company, Limited, and will build a line from Aberdeen into the southeastern country.

## **Belle Plaine, Sask.**

Tenders were received until April 15th, 1909, for the construction of the Stony Beach Rural Telephone Company's telephone lines. All material will be supplied, and the poles distributed.

## **Brandon, Man.**

The City Council has applied to the municipality of Winnipeg for service from its civic power plant at Point du Bois, which is about 200 miles from this city.

## **Brockville, Ont.**

The Beach Company, of Iroquois, have valuator out arranging to purchase a pole route for an electric power line from Iroquois to Brockville.

The town is intending to extend its electrical system and waterworks pumping station. C. H. & P. H. Mitchell are engaged in making a report upon the matter and are advising on the economies of a combined generating and pumping plant.

## **Bracebridge, Ont.**

A proposition is mooted to construct an electric road from Bracebridge or South Falls to the mines.

## **Calgary, Alta.**

It is reported that the Calgary Power & Transmission Company will commence work immediately on its proposed power development at Horseshoe Falls, which will involve an expenditure of more than \$1,000,000.

## **Cochrane, Alta.**

The Calgary Power & Transmission Company, of Calgary, Alta., has entered into an agreement to supply the town of Cochrane with electricity for lamps and motors. The company is also negotiating with several other towns to furnish electrical service.

## **Condie, Sask.**

Tenders addressed to N. Henderson were received until April 15th for construction of the Condie rural telephone system.

## **Dunnville, Ont.**

The ratepayers have defeated a bylaw to grant \$5,000 as a bonus to the Dunnville, Wellandport and Beamsville Railway.

## **Duncans Station, B.C.**

The Portland Canal Mining Company is making arrangements for the installation of a power plant, aerial tram and concentrator at an approximate cost of \$75,000. C. H. Dickie is president of the company.

## **Edmonton, Alta.**

The provincial government will build eight hundred miles of telephone lines this year.

## **Fort William, Ont.**

At a special meeting of the joint railway commission held recently, it was decided to purchase a new generator, large enough to operate the entire system, and place it in the Kam Power Company substation.

The farmers of Paipoonge Township are organizing to secure a rural telephone sys-

tem, which will be connected with this city and also with Port Arthur. For further information address Dr. D. C. Garver.

## **Fernie, B.C.**

The Cranbrook Telephone Company, of Cranbrook, B.C., have decided to build a telephone line between Fernie and Lethbridge.

## **Grey, Sask.**

Tenders were received by Elmer Auld, Grey, Sask., until April 3rd for the construction of 24 miles of telephone line, 30 poles to the mile, and 72 miles of wire for the Grey-Milestone Telephone Company.

## **Grand Falls, N.B.**

Additional equipment consisting of air compressors, electric motors, drills, tunnelling machines, pumping, hoisting engine, derricks, concrete mixer, rock crushers, gasoline tow boat, scows, machine and blacksmith shop tools, etc., will soon be purchased by Frank B. Gilbreth, of New York, N.Y., to be used in connection with the construction of the hydro-electric plant on the St. John River, at Grand Falls, N.B., for the Grand Falls Power Company. This equipment is for the contractor's plant. The hydro-electric machinery for the permanent equipment of the main power plant will not be purchased by Mr. Gilbreth, who has the contract only for the construction work involved in the development of the water power. John B. McRae, Ottawa, Ont., is chief engineer, and Ralph Mershon, New York, N.Y., electrical engineer.

## **Hamilton, Ont.**

The Toronto & Hamilton Electric Railway Company is about to open negotiations for an entrance into Hamilton, and it is believed that the construction work is to be gone on with at once. Allan H. Royce, the company's solicitor, will send an engineer to Hamilton at once to take the matter up.

The city will probably do the work of putting its fire and police alarm system wires under ground instead of making an arrangement with the Bell Telephone Company. The company estimated the cost for the cable at about \$1,000 a mile, and it is said it would charge the city \$264 a mile a year rental for the conduit. Mr. Barrow, consulting engineer, thinks the city can put the wires under ground for about \$1,300 a mile.

## **Ingersoll, Ont.**

The council will endeavor to acquire the plant of the Ingersoll Light and Power Company. They have been empowered to institute arbitration proceedings, if necessary, to fix the price.

## **Kamloops, B.C.**

H. K. Dutcher, consulting engineer, reporting upon the power project, estimates the cost of changing to the three-phase system at \$20,000. This includes the installation of a new intake pipe.

## **London, Ont.**

Pay-as-you-leave cars are being tried out on the local electric railway.

The Street Railway Company are considering the advisability of putting in a producer gas plant, and not taking Niagara power. The Colonial Engineering Company

has inspected the company's plant, and is prepared to furnish the power at \$22 per horse-power.

City Engineer Sifton has recommended to the City Council the acceptance of the offer of the Hydro-Electric Power Commission to supply 5,000 electrical horse-power at \$29.81 per horse power per year.

Mr. R. S. Kelsch, of Montreal, has been retained as electrical expert by the city in connection with the proposed power scheme.

## **Lethbridge, Alta.**

The Alberta government has purchased a site in Lethbridge for a telephone exchange, which will be the long distance headquarters for Southern Alberta. For further information address W. H. Cushing, Calgary, Alta.

## **Listowel, Ont.**

The bylaw to provide money to establish a municipal lighting plant here carried by a large majority on April 19th. Work will be proceeded with immediately and contracts will be made with Messrs Kilmer, Pullen and Burnham for two 50 kw. generators; the Robb Engineering Company, for engines; Watrous Engine Works, boilers; George Thomas, Windsor, line material and erection. C. H. & P. H. Mitchell are the engineers for the town.

## **Melville, Sask.**

The Council is considering plans for a local telephone system. For further information address Leon Benoit, secretary.

## **Midland, Ont.**

It is officially announced that the Simcoe Electric Railway & Power Company, Midland, will begin this year the construction of an electric railway to connect Penetanguishene, Midland, Victoria Harbor, Waubashene and Coldwater. The company expects to build a power plant at Big Chutes, on the Severn river. It is the intention to furnish power for lighting purposes. Capital stock authorized, \$500,000. Bonds authorized, \$400,000. Provisional directors:—James Playfair, Douglas L. White, W. Finlayson, Midland; W. J. Sheppard, Waubashene, and W. J. Lovering, Toronto.

## **Manor, Sask.**

Plans are being made to organize a local and rural telephone company in Manor. For further information address W. G. Bell.

## **Montreal, Que.**

The Montreal & Southern Counties Railway Company, which proposes to construct an electric railway between McGill street and several communities on the South Shore, it is said, will soon award contracts for electrical equipment for its proposed railway. Announcement has been made that work will soon commence on the construction of its substation and car barns at St. Lambert, Que.

There is a bill before the Quebec Legislature to grant the Canadian Light and Power Company a charter to carry on operations in this city.

The Bell Telephone Company, of Canada, has appropriated \$1,000,000 for improvements and extensions during the year 1909.

Sir Thomas Shaughnessy states that the C. P. R. will make a number of experi-



ments with electrical storage locomotives on the western lines of the company this year.

Application is being made for the incorporation of the Canadian, Liverpool and Western Railway Company with powers in addition to the construction of railways, to distribute electrical power. For further information address S. G. McClenahan.

#### New Liskeard, Ont.

Mr. Cecil B. Smith, consulting engineer, of Toronto, has been engaged in connection with a project for developing water power on the Matabitchouan river.

#### New Glasgow, N.S.

A bill has been introduced into the local legislature to confirm an agreement by which all the plant, franchises and good-will of the New Glasgow Electric Light Company, Limited, are to be transferred to the Egerton Tramway Company, Limited.

#### Ottawa, Ont.

The Ottawa Electric Railway will construct several extensions this summer. Among the lines to be relaid with heavier rails this summer are: Somerset street, from Bronson to Holland avenue; Rockcliffe from Princess avenue to the terminus; and Sparks street, in the event of it being repaved.

#### Peterborough, Ont.

The ratepayers have defeated a bylaw to issue debentures for \$15,000 to develop municipal power in connection with the new dam.

#### Port Arthur, Ont.

Bids will be received by the Railway Commissioners for material required to complete the double track of the Port Arthur & Fort William Electric Railway to the Fort William boundary. About 20 miles of new track will be added to the railway during 1909. N. C. Pilcher, of Port Arthur, is general manager.

The Railway Commissioners will receive bids for rails, ties and other construction material required to complete the double-track of the Port Arthur & Fort William Electric Railway to the Fort William boundary. About 20 miles of new track will be added to the railway during 1909. N. C. Pilcher, Port Arthur, is general manager.

#### Prince Albert, Sask.

At a special council meeting held recently, it was decided to secure a franchise from the Dominion Government to develop 10,000 horse-power at Coal Falls. An expert engineer will be engaged immediately to survey the dam site and canal, and prepare estimates. The preliminary report of Mr. C. H. Mitchell estimates a working head of 40 feet and the cost of the dam and canal for navigation at \$1,000,000.

#### Stamford, Ont.

The township council are considering the question of extending the electric street lighting system to Lundy's Lane, Falls View and other side streets in the town. The Ontario Distributing Company have agreed to extend their transmission lines if they can secure contracts to place 800 lamps in residences in that section of the town. A committee has been appointed to make arrangements to secure the service.

#### Stellarton, N.S.

The Edgerton Tramway Company, Limited, are reported to have purchased the power plant of the New Glasgow Electric Company, Limited. It is proposed to move the plant from New Glasgow to the former company's buildings at Stellarton. It is

probable that considerable new equipment will be installed. Alvin McDaniel is the Chief Engineer.

#### Saskatoon, Sask.

The Saskatoon Telephone Company at its annual meeting showed that the profits for the year amounted to 13 per cent. on the paid-up capital, and a dividend of 8 per cent. was declared, the balance being placed to the reserve account.

#### Theodore, Sask.

The Springside Telephone Company will commence at once the work of building 80 miles of line. Switchboards will be installed at Theodore, Springside and Beaverdale.

#### Toronto, Ont.

The Toronto Railway Company have arranged to lay new tracks upon portions of College street, Avenue road, Yonge street, Gerrard street, Church street, and Queen street, and the City Engineer proposes to construct an entirely new foundation.

City Electrical Engineer Aitken has forwarded to Mr. Alexander Dow, the Detroit engineer, the specifications for the conduits and ducts necessary in the construction of that section of the municipal electric plant south of Queen street and from the Don to the Exhibition Grounds. Mr. Aitken states that 300,000 feet of ducts will be required for this section of the work.

The first quotations on Hydro-Electric power for Toronto were recently issued by Mr. C. L. Aitken, City Electrical Engineer. They concern users of large units only and those who will either be able to cut out during peak load or generate their own power at that period. A prohibitive rate of six cents per horse power per hour is to be enforced for users of "peak" current. The following are the figures as given out by Mr. Aitken:

Demand in H.P.	Monthly bill	Flat rate per H.P. per month.	Meter rate per H.P. per hour off peak.	
			per H.P.	per hour off peak.
300	\$ 344	\$2.29	.71	
400	425	2.12	.65	
500	506	2.02	.62	
600	588	1.96	.60	
800	750	1.87	.58	
1,000	912	1.82	.56	
1,200	1,075	1.79	.55	
1,500	1,320	1.76	.54	
2,000	1,725	1.72	.53	

#### Vancouver, B.C.

Bonds of the Stave Lake Power Company have been underwritten to the extent of \$2,500,000, and the work of completing the station at Stave Lake will be pushed. Power will be delivered in Vancouver and Westminster within eighteen months. This announcement was made recently by William McNeil, secretary of the company. Large Eastern Canadian interests are represented by C. H. Cahan, of Montreal and Halifax.

#### Victoria, B.C.

There is a likelihood that the city will not make additions to the electric light plant this year as was intended. It was estimated that to provide for additional lights in the city an expenditure of at least \$20,000 would have to be made. Rather than do that the council is considering the question of taking from the British Columbia Electric Company sufficient to supply present needs. The electric light committee will investigate and report.

#### Wilcox, Sask.

Sealed tenders were received by A. E. Hadley until April 5th for all work and materials necessary for the construction of

a telephone system for the Wilcox Rural Telephone Company.

#### Winnipeg, Man.

Tenders addressed to M. Peterson, Secretary, Board of Control, were received until April 21st for supply of 10,000 pounds No. 6 B. & S. triple braid weather-proof copper wire. Specifications at office of City Electrician.

Two contracts have been awarded recently in connection with the Winnipeg power development at Point du Bois. The contract for line insulators was awarded to the Locke Insulator Manufacturing Company, of Victor, N. Y.; to the Stuart Machinery Company, a contract for machine-shop equipment, for \$1,554. Work has commenced on clearing the right of way for the transmission line, which will be 75.5 miles in length.

Tenders addressed to the Williamson Construction Company, Toronto, were received until April 13th for construction of concrete footings for steel towers for the Winnipeg transmission system.

Smith, Kerry & Chace, engineers for the power scheme, have sent in an estimate that \$782,544 will be the amount expended on the scheme during the fiscal year beginning May 1st next.

#### AWARDED.

##### Calgary, Alta.

Contracts have been awarded by the Street Railway Company, as follows: Federal Electric Company, Montreal, Que., aluminium, contract price, \$4,500. The nearest competitor was the Northwest Electric Company, of Edmonton, whose price was \$50 lower. The Northwest Electric Company will furnish the overhead specials for \$1,947.90. Wm. Stuart & Company will supply the wooden poles needed for \$3,400. Copper bonds will be supplied by the Canadian General Electric Company, Peterborough, Ont., for \$5,070.

The City Council has awarded the following contracts for material to be used in the construction of the Calgary Municipal Railway: 1,110 tons of steel rails, 400 tons of which will be 80-lb. and 710 tons, 60-lb., to Lorain Steel Company, represented by Gorman, Clancey & Grindley, Calgary, for \$70,000; the contract for ties to the East Kootenay Lumber Company, at 56 cents each. The Standard Supply Company secured a contract for the steel poles required at \$32.50 each for 28-foot poles.

The contract for the motor generator and switchboard of the Calgary power house was awarded to Allis-Chalmers-Bullock Company, of Montreal, at \$15,950.

The following tenders were submitted to the Water & Light Committee for two electric turbo pumps: Canadian Crocker Wheeler Company, Montreal, Que., f.o.b. Moncton, \$3,660; Goulds Manufacturing Company, Syracuse, N.Y., f.o.b. Moncton, \$4,200; R. H. Buchanan, Montreal, Que., f.o.b. Moncton, \$3,993; Canadian Buffalo Forge Company, Montreal, Que., f.o.b. Montreal, \$3,180; Peacock Bros., agent English firm, f.o.b. Montreal, \$3,435; Canadian Fairbanks Company, Montreal, Que., f.o.b. Montreal, \$4,768; Canada Iron & Foundry Company, Toronto, f.o.b. Moncton, \$4,127; Canada Iron & Foundry Company, Toronto, Ont., erected, \$4,500; Drummond McCall Company, Montreal, erected, \$5,789.40; The John McDougall Caledonian Iron Works Company, Montreal, erected, \$5,440. The contract was awarded to the Canada Foundry Company.

#### Montreal, Que.

The contract for two miles of 3-conductor paper insulated lead covered cable, under a five-year guarantee, has been

(Continued on page 38)



Isn't it reasonable to suppose  
that we, as

# The Most Successful Lamp Makers in Canada

know more about Lamps than you?

And isn't it the part of wisdom for  
you to **Profit** by our knowledge  
when we offer it to you **Free**

Let us serve you

**The Sunbeam Incandescent Lamp Co.**  
of Canada, Limited

**Factories:**

Toronto and St. Catharines

**Main Office:**

Toronto, Ont.

Northwestern Office and Warehouse: **Winnipeg**

## For Sale

1 Electric Motor, 60 h.p., 3 phase, 60 cycles, 2000 volts. Made by the C. Q. E. & Co. Nearly new. W. A. HALE, Sherbrooke, Que. tt

## For Sale

One Warren Generator, 150 K. W. single phase, 133 cycles, 2200 volts, 800 speed, complete with Exciter and Switchboard; only in use one year. For further information apply to

S. T. KELLY, City Electrician,  
Strathcona, Alberta.

## Electric Light Plant for Sale

by Town of Parry Sound

replaced by larger plant. A snap for party wanting plant this size. One 75 K. W. Monocycle Dynamo 2080 volts, 60 cycle; Exciter, switchboard, rheostat, etc., \$700. One McEwen double engine 120 h. p., \$700. Two tubular boilers and smoke stack, \$1,600. One belt pump, \$50. Whole to one party. \$2,950 or separately as above.

Apply to

G. GROVES, Supt.,  
Box 422, Parry Sound.

tt

## Electric Signs!

A firm manufacturing up-to-date Signs are open to appoint selling agents. Would like to get in touch with reliable and aggressive firms or individuals who would push this line either all over Canada or in sections to be arranged. Correspondence confidential. Address

Box 723, Electrical News  
Toronto 5

## Wanted

To correspond with Canadian firms who are legitimate jobbers of electrical material, who do no contracting or sell electric current, by a manufacturer with a view of establishing agencies in Canada for Standard Electrical Specialties paying a very liberal margin. Box 727, ELECTRICAL NEWS. 6

## Wanted

Names of Electrical Firms who are prepared to take up the manufacture of an electrical device requiring light machinery. Address

W. Carlile Wallace,  
203 Greenwick St.,  
New York, N.Y.

awarded by McGill University to the British Insulated & Helsby Cables Limited, Montreal.

Laurie & Lamb, engineers, this city, advise us that they have placed with Belliss & Morcom, of Birmingham, England, an order for two 150 kw. Belliss engines for installation at McGill University for their power plant. These engines will be direct connected to generators. They are of the two-crank compound type, with a special expansion gear fitted so as to care for overloads, and still maintain economy of steam consumption.

The Northern Commercial Telegraph Company have awarded a contract to Michael Connolly, of Montreal, to build one thousand miles of telegraph and telephone line from Point Levis to Windsor, Ont., as well as several branches.

Nelson, B.C.

The Allis-Chalmers-Bullock Company have the contract for putting in the turbine and generator at the city power plant to complete the second unit at Bonnington Falls. Estimated cost, \$75,000.

Toronto, Ont.

The Standard Electric Company, Confederation Life Chambers, Toronto, have been awarded the contract for the electrical work in the new dock at York street for the Ontario Dock Company, and for the park lighting and signs in the new west end park being opened by Mr. Morris Wolff. T. H. Mace, manager.

The Temiskaming & Northern Ontario Commission has accepted the tender of the Dominion Wire Manufacturing Company, of Montreal, for 75,000 pounds of hard drawn copper wire, No. 10 gauge, to be used in the building of new telegraph lines.

The Toronto and York Radial Railway Company have awarded to the Philadelphia Railway Company a contract for eight new cars to cost \$6,000 each.

Laurie & Lamb, Montreal, Canadian agents for Belliss & Morcom, Birmingham, England, have recently received an order from Toronto University for a Belliss engine for use in the hydraulic laboratory. This engine will operate a couple of centrifugal pumps by belt.

Vancouver, B.C.

The contract for the police signal patrol system has been awarded to the Gamewell Company, an American concern, at \$12,647. The Northern Electric Company of Canada tendered at \$12,200.

The tender of the Great Northern Aluminum Company, of Montreal, at \$45,000, has been accepted by the B. C. Electric Railway Company, for 390 miles of aluminum wire to be used for transmission purposes on the Chilliwack line.

Windsor, Ont.

The City of Windsor have awarded to E. Leonard & Sons, of London, Ont., the contract for the steel boiler and engine required for their electric light works. The following is a list of the tenders submitted: E. Leonard & Sons, London, Ont., steel boiler, \$1,090; 250-horse power Cross Compound engine, \$3,250. John Inglis & Company, Toronto, boiler \$1,425. W. J. Bradley, boiler, \$1,650. Clinton Engine Company, boiler, \$1,750. Waterous Engine Company, Brantford, boiler, \$1,087; engine, \$3,477. Polson Iron Company, Limited, Toronto, boiler, \$1,825. Canada Foundry Company, Limited, Toronto, boiler, \$1,460. Robb Engine Company, Amherst, N.S., boiler, \$1,340; engine, \$3,098. Goldie & McCulloch, Galt, Ont., boiler, \$1,137; engine, \$3,345.

## Business Opportunity

Advertiser would like to meet an experienced Electrical Salesman with capital to invest in small business handling well known high-class lines, and having excellent prospects. Substantial interest for right man. Box 715 CANADIAN ELECTRICAL NEWS, Toronto. 5

## Agents Wanted

A United States Firm manufacturing chemical preparations for water purifying, etc., is prepared to appoint representatives in Toronto and other large Canadian cities. Would like to get in touch with good parties who would be in a position to purchase the chemicals, selling on his own account, or some good responsible party who would handle on commission. Correspondence strictly confidential. Write

Box 721, Electrical News  
Toronto 5

## City of Fernie

(Province of British Columbia)

Tenders for

## Electric Light and Power System

Sealed tenders addressed to the undersigned will be received at the City Clerk's Office up to 5 p. m.,

May 13th, 1909

for the construction of an Electric Lighting system and the equipment in connection therewith.

Copies of plans and specifications may be obtained at the City Engineer's office.

Each tender must be accompanied by a certified cheque for 5 per cent. of amount of bid, payable to the order of the City of Fernie.

Individual tenders will be received for

- (a) Electric Lighting Distribution System.
- (b) Erection of Power House and Foundation.
- (c) Removal of Power Plant from Coal Creek and erected in station at Fernie, and installing Boilers.
- (d) Supplying 3 Horizontal Return Tubular Boilers, 150 H.P. guaranteed B.C. Inspection at 125 lbs., with Stack and Blower complete, one Feed Water Pump, one Injector, one Feed Water Heater.

Tenders may be made for one or more of the above items.

The lowest or any tender not necessarily accepted.

G. H. BOULTON,  
City Clerk.

R. POTTER,  
City Engineer. 18

## DO YOU WANT TO SELL

second-hand machinery of any kind? Many a central station manager has one or more machines for which he has no further use.

## SOMEBODY WANTS TO BUY

just such machines. You can get in touch with that somebody by advertising in the "Wanted and For Sale" Column of the ELECTRICAL NEWS. The expense is trifling.





## A New Canadian Carbon Company

It is a well known fact that France is leading the world in the manufacture of high grade carbon products. Of all French carbon products, "Fabius Henrion" carbons for enclosed arc lamps have earned for themselves for the past five years an enviable position in the American market. These carbons have also been used for a number of years by the leading central stations throughout the Dominion of Canada, and the demand for them has so increased during the past year that the importers who have handled the Canadian end of the business before from New York, have thought it advisable to organise a company which will be known as the Canadian National Carbon Company, Limited, with offices 12, 14, 16 Shuter street, Toronto, to take special care of the Canadian trade. The company will carry a large stock of standard sizes of carbons for enclosed arc lamps, flame carbons of every type, as well as absolutely noiseless carbons on alternating and direct current for moving picture lamps. As the new company is absolutely independent of the American Carbon Trust, they are in a position, as we understand, to quote very attractive prices, and are prepared to give the Canadian consumer the benefit of their direct low cost importations from France. The management of the company is in the hands of Mr. Alfred Landau, who is also closely connected with Electrical Specialties, Limited, and the success with which Mr. Landau has met in introducing the renowned X cells throughout the Dominion, is the best guarantee that he will meet with similar success for the Canadian National Carbon Company, Limited. The company is prepared to furnish free samples for testing purposes to any interested party. The facility with which any carbons can be tested by the consumer, render valueless exhaustive laboratory tests so often submitted. But we think that our readers will be interested in the results of a test recently made, therefore we submit here some interesting data. The arc lamp used was an enclosed G. E., d.c., operating on a 120-volt 5 amperes circuit, with clear inner globe. The carbons were solid, of  $\frac{1}{2}$ -inch x 12-inch, and showed the following: Resistance, 0.00635 ohms per c.m.; life, 115 hours 50 minutes; rate of consumption, 0.1638 grams per hour, or 0.0945 c.ms. per hour; ash deposit, 0.049 grams; maximum spherical candle power, 280; mean, 223; watts per mean spherical candle power over arc, 1.55; watts per mean spherical candle power over lamp, 2.69.

The new Canadian company, which is backed by ample capital, business ability and experience, and in which, as we understand, men of high standing in the electrical fraternity are interested, deserves the heartiest assistance of the consumer.

## Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the *Electrical News* may obtain the name of the enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

96. Agent.—A Scottish firm manufacturing electric, hydraulic, steam and hand lifts, etc., hydraulic presses and pumps, wishes to get into touch with a reliable agent in Canada.

179. Cranes.—A north country company manufacturing cranes and other lifting machinery, also railway plant, would like to get in correspondence with Canadian importers.

176. Agency.—A London firm wishes to get into touch with Canadian firms dealing in table glass, glass telegraph insulators, etc., open to take up an agency for the sale of such goods.

284. Representation.—A Lancashire correspondent wishes to secure the representation of some Canadian produce exporter.

286. Agents.—A London firm manufacturing electric lifts, cranes and elevators; hydraulic lifts and cranes; and wind turbines for pumping and the production of electricity for lighting and power, wishes to get into touch with a Canadian engineering firm having representatives in the principal centres in the Dominion who might be open to handle their goods.

292. Electric heating, etc.—A German manufacturer of electric heating and other specialties, and also of asbestos woven wire resistance nets and similar lines, tinned and galvanized wire, etc., ask to be placed in communication with Canadian importers.

359.—Engineering materials.—A Manchester firm of engineers are in a position to undertake the purchase, inspection and shipping of engineering materials of all kinds, and would like to get into touch with Canadian railways, mines, factories or importing houses, wishing to utilize their services.

402. Railway rolling stock.—A Scottish firm manufacturing railway rolling stock requirements in bar iron wishes to get in touch with Canadian buyers.

A neat celluloid case containing requisites for repairs, namely courtplaster, forms an attractive advertising novelty that the Electrical Specialties, Limited, 12-16 Shuter street, Toronto, are distributing.

Quite an original method of advertising is being used by the Weston Electrical Instrument Company, of Newark, N.J. It takes the form of a private post card, containing a series of school talks on Weston instruments.

# Construction Material

Insulators, Pins, &c.

Rail Bonds

## Dawson and Company, Limited

Electrical Supplies and Apparatus

MONTREAL

WINNIPEG

### The Copper Markets

April generally was a dull month for copper, only succeeding in increasing the surplus stock held by American manufacturers. United States Customs reports show that 46,645,760 pounds were exported in March, and in the neighborhood of 61,500,000 were used by home consumption. Prices are steady with little evidence of pressure on the part of producers or selling agents to make sales. For the first week in April exports from the United States averaged 1,000 tons per day. Metal Exchange quotations:

Lake .....	12 $\frac{7}{8}$ @ 13
Electrolytic .....	12 $\frac{1}{2}$ @ 12 $\frac{5}{8}$
Casting .....	12 $\frac{3}{8}$ @ 12 $\frac{1}{2}$

London prices:

	£	s.	d.
Standard copper, spot .....	57	0	0
Standard copper, futures .....	57	13	6
Market .....	Easy		

Fluctuations for the year:

	Highest.	Lowest.
Standard .....	.....	.....
Electrolytic .....	14.25	12.12 $\frac{1}{2}$
Lake .....	14.55	12.55
Casting .....	14.12 $\frac{1}{2}$	12.00
London, spot .....	£64 2 6	£54 12 6
London, futures .....	64 17 6	55 10 0
London, best selected .....	67 15 0	59 0 0

After the Toronto controllers opened a batch of side-walk tenders last week Controller Hocken expressed the opinion that there did not seem to be a keen rivalry among contractors for the work. He hinted that they

seemed inclined to "divide it up." City Engineer Rust's tenders were accepted for six out of twenty contracts.

### MOONLIGHT SCHEDULE FOR MAY.

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
May 1	2 00	May 1	4 20	2 20
2	2 20	2	4 20	2 00
3	No Light	3	No Light	
4	" "	4	" "	
5	" "	5	" "	
6	7 30	6	9 50	2 20
7	7 30	7	10 50	3 20
8	7 30	8	0 00	4 30
9	7 30	9	1 00	5 30
10	7 30	10	1 50	6 00
11	7 30	11	2 30	7 00
12	7 30	12	3 10	7 40
13	7 30	13	3 50	8 20
14	7 30	14	4 00	8 30
15	7 30	15	4 00	8 30
16	7 40	16	4 00	8 20
17	7 40	17	4 00	8 20
18	7 40	18	4 00	8 20
19	7 40	19	4 00	8 20
20	7 40	20	4 00	8 20
21	7 40	21	4 00	8 20
22	7 40	22	4 00	8 20
23	7 40	23	4 00	8 20
24	10 40	24	4 00	8 20
25	11 10	25	3 50	5 10
26	11 40	26	3 50	4 40
27	0 10	27	3 50	4 10
28	0 30	28	3 50	3 40
29	0 50	29	3 50	3 20
30	1 20	30	3 50	3 00
31		31	3 50	2 30

Total .....159 30

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Now wouldn't it interest you—wouldn't it mean money in your pocket—if you could save from a quarter to one half of what your power is costing you to-day?

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We want to give you all the facts about Western Electric Induction Motors and prove to you conclusively what saving in dollars and cents and what increase in efficiency that system of power will effect in your plant.

Look your plant over and figure out how many tons of metal you keep rotating over the heads of your workmen and how many square feet of belting you keep travelling at express train speed.

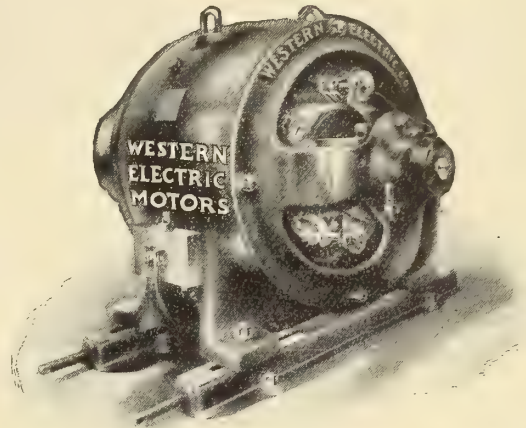
It takes power to keep that mass of non-productive machinery moving. Power that costs you money and adds nothing to the production of your plant.

Twenty-five to fifty per cent. of power developed by your engine is lost by the line shaft and belt transmission system. This fact has been repeatedly proven by actual tests.

You can save this loss—add it to your profits by installing Western Electric Induction motors.

They can be mounted on the floor, wall or ceiling as required, or on the machines which they are to operate, thus eliminating all belts and hangers.

Western Electric Induction Motors are the simplest of all elec-



trical machines. In operation they are as simple as a shaft rotating in its bearings and require no attention beyond that given to bearings.

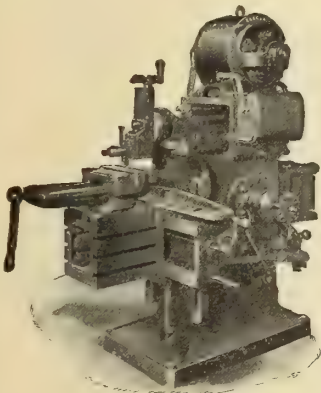
The individual motor driven machines form compact units in themselves, thus allowing the workmen to get around them better and do better work. Besides this you pay only for the power used in actual production—only the machines which are actually employed in turning out your product need be kept running.

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We would be glad to have our engineers look over your plant and prove to you by actual figures what a saving you can effect by installing Western Electric Motors. This service is absolutely free and puts you under no obligation to us.

Write to-day for Bulletin No. 107 and full particulars.

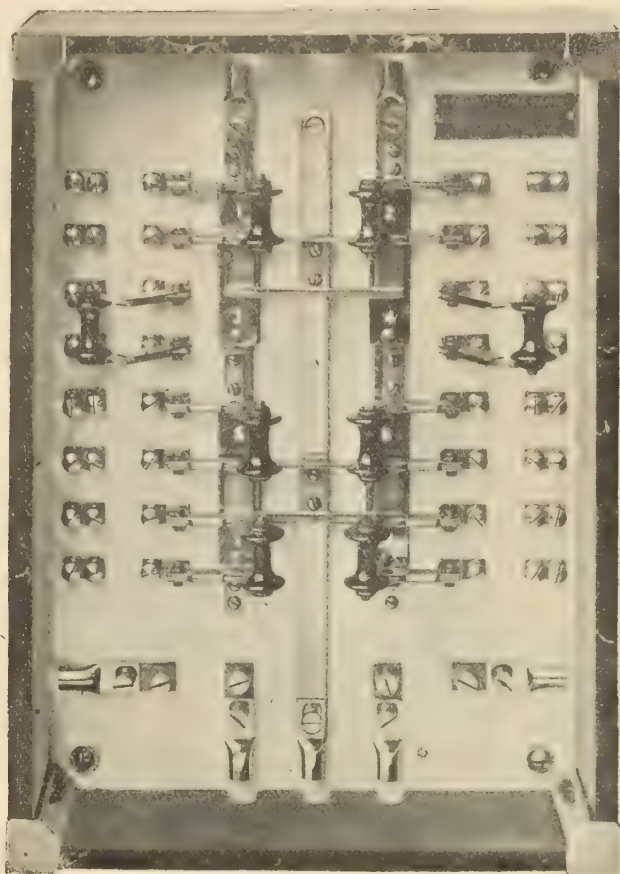


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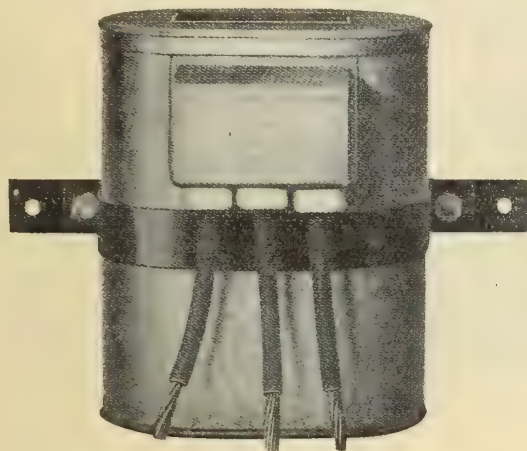
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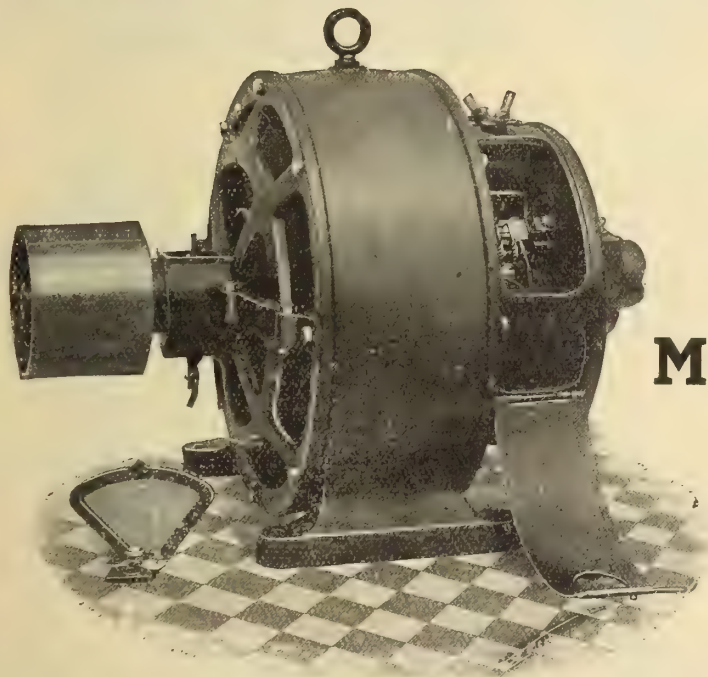
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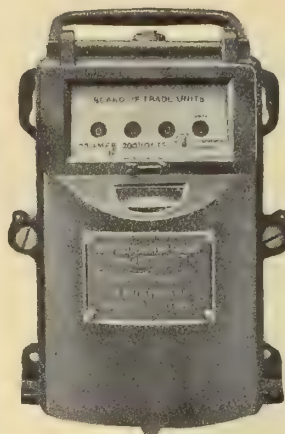
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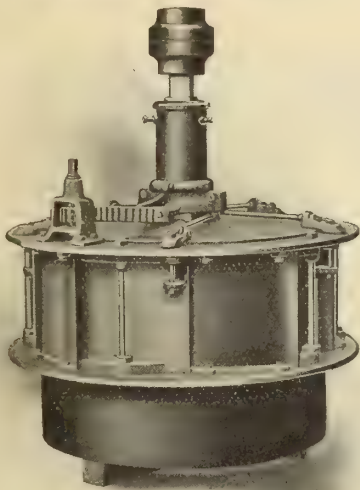
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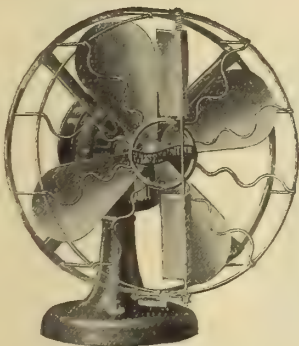
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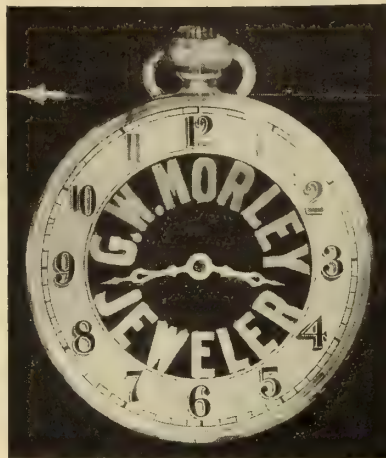
It is to the interest of all **Central Stations** to handle our signs! They come on when your motor load is off.

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## Central Station Men



The A. & W. One Light Signs are made to conform with all lines of business. The watch sign as above and, along the same line, a hat, a mortar, and a sign made with barber poles.

quickly realizing the advantages of our proposition have answered our former ads promptly. However, there may be a few stations we have not heard from. Should you be one, do not delay, give your stenographer a letter **NOW**, and let us fully explain to you the one great proposition

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They encourage the use of electric light. Put consumers on your line you otherwise never could get.

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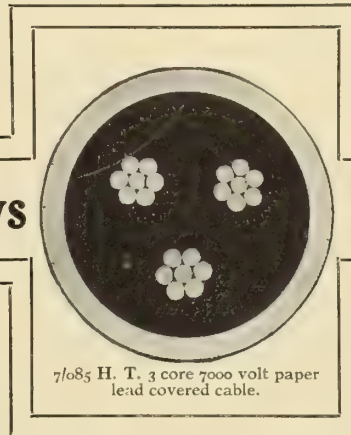
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**Lineman's Shield for High-Tension Circuits**

The necessity of working on electric wires carrying as high as 8,000 and 10,000 volts, and the disadvantage of shutting off the current when such work is being done, has made a protective shield absolutely indispensable for the proper protection of the linemen, says "Popular Mechanic." This curious shield consists of a rubber insulation which slips over the wire and is clamped firmly in place by hard rubber slip rings at both ends. Both the shield and the rings are slit to admit the wire. The shield is designed for use on wires carrying a tension up to 7,500 volts, but has been used without danger on circuits carrying 10,000 volts, having been tested to 30,000 volts. The lineman stands on two shields, leaning against the third, and with the fourth grasps a wire from which he can cut the insulation with a knife held in his bare hand. So protected, there is no way for the current to ground or make a short circuit through his body with one of the other wires, therefore he is in no danger from the high tension. It is advisable, however, to take the additional precaution of wearing rubber gloves. It is also necessary to use only pure Para rubber in making the shields, as reclaimed rubber often contains small metallic particles which interfere with its insulating qualities. Special care must also be taken to protect the shields from grease, moisture, and injury.

**High Voltage Fuse Tongs**

When inserting and removing fuses on high voltage circuits there is considerable danger. The Australasian Hardware states that tongs have been devised to handle fuses on mains carrying 40,000 volts with safety. These tongs can be manipulated with one hand. The handle is of wood and is insulated from the tongs by a corrugated insulator which has been tested up to 40,000 volts. As soon as the tongs are placed against the fuse they open automatically, embrace the fuse tube, and close again. The handle is then turned slightly, and this locks the tongs so that the fuse may be withdrawn. On inserting the fuse the reverse action takes place.

**Effect of Canal on Niagara**

According to Engineer N. S. Wheeler, of the United States Government Department, the proposed Sag Canal to divert the channel of the Calumet river, would be disastrous for Niagara Falls. It would mean the diversion of 4,000 gallons of water a second from Niagara and would reduce the available power of Niagara to 490,000 horse power. The United States Government are claiming the right to interfere with the construction work on the ground that the Calumet river is a navigable stream.

**Saskatchewan and the Bell**

It is reported that the Government of Saskatchewan has acquired the entire plant, with the local and long distance exchanges of the Bell Telephone Company in Saskatchewan. When interviewed at Montreal, Mr. Size, president of the Bell Company, stated that the company had not received word from their Regina office regarding the matter. They had not even been notified that negotiations were under way. A despatch from Regina says that the deal has been consummated and a cash price paid.

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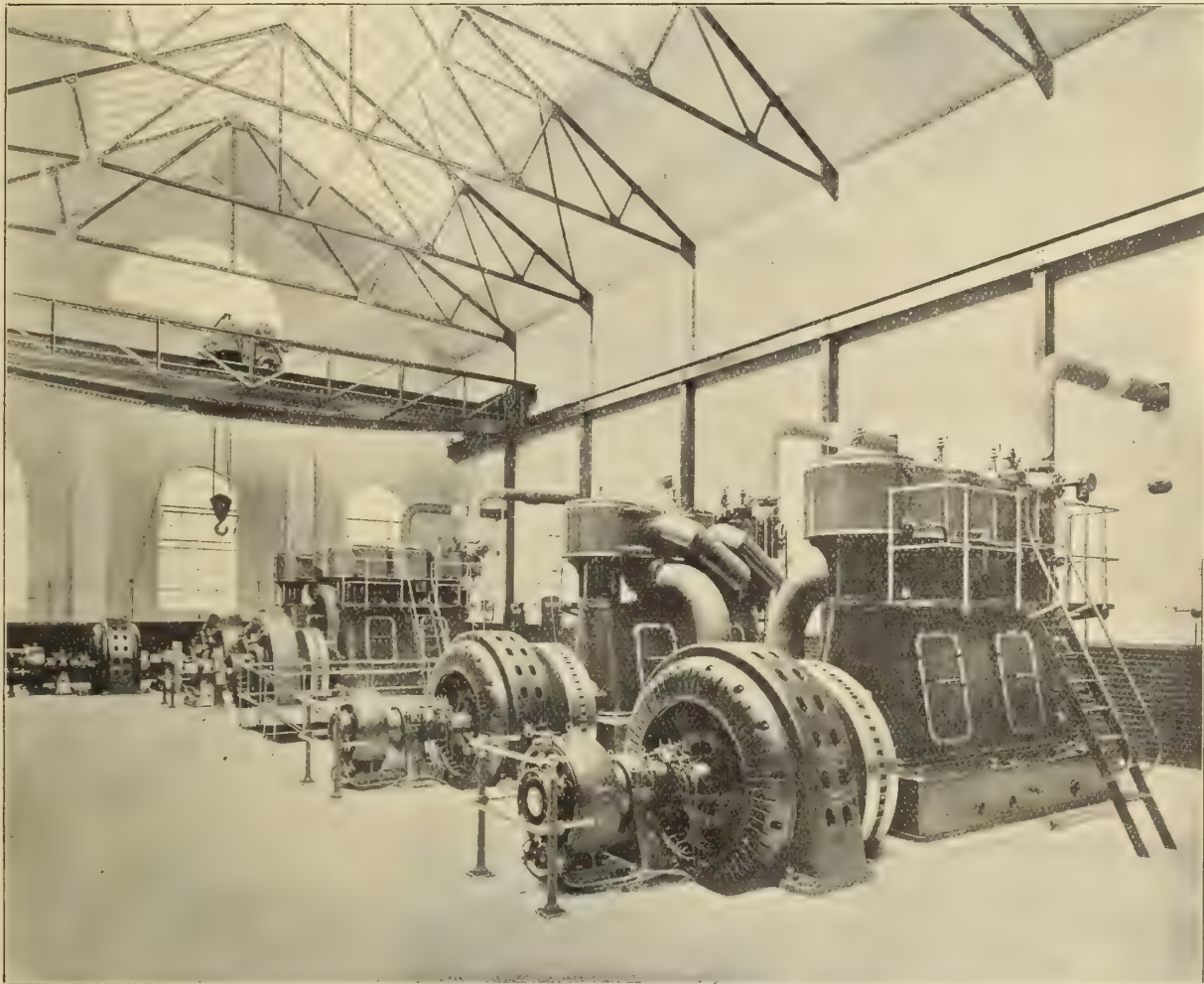
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**TORONTO, - - - CANADA**



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800,000 H.P. Running — All Giving Satisfaction  
Guaranteed Steam Economy — Even Turning — Noiseless Running



Hastings Tramway Station — 3430 B.H.P. Belliss Engines.

Simple, Compound and Triple Expansion Engines.  
Surface, Jet and Barometric.      Condensers, Air Compressors.

**Belliss & Morcom Limited, Engineers**  
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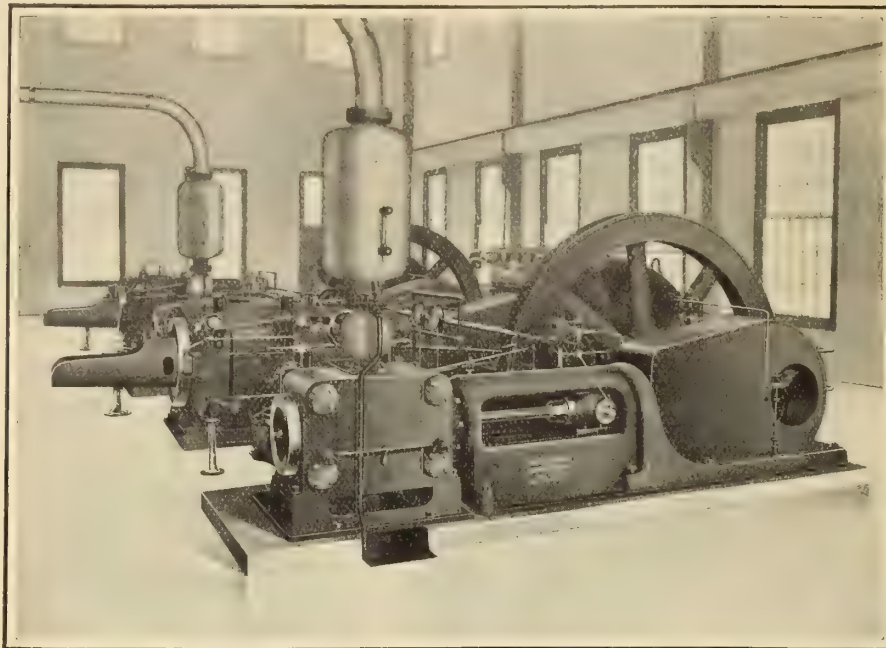
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# LAURIE & LAMB

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Shall we send you catalogue describing our new type of Condenser.



# Goldie Corliss Engines

Illustration shows the  
Power House of the  
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shops at Stratford,  
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CORLISS ENGINES.**

**Direct Connected**

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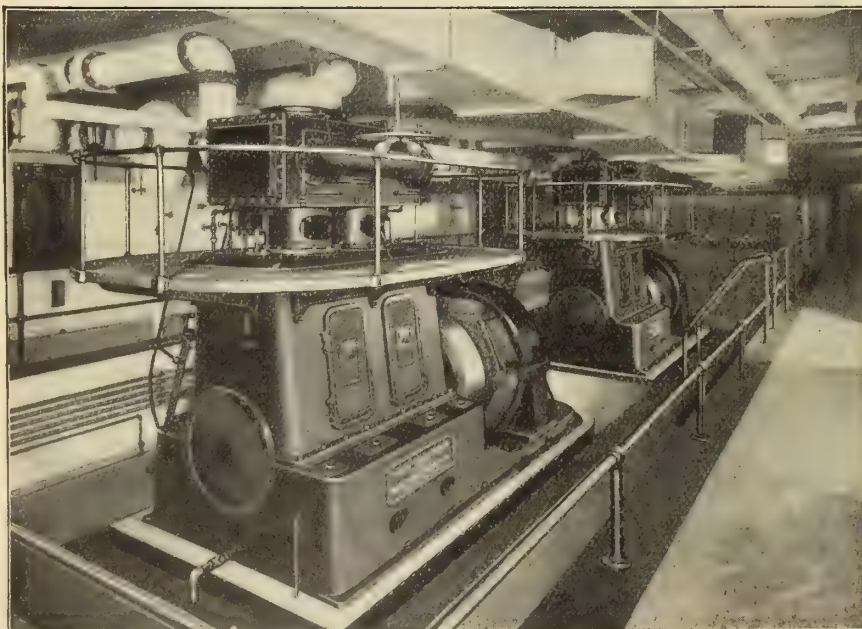
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**WE MAKE** Wheelock Engines, Corliss Engines, Ideal Engines, Boilers, Heaters, Tanks, Steam and Power Pumps, Condensers, Flour Mill Machinery, Oatmeal Mill Machinery, Wood-Working Machinery, Transmission and Elevating Machinery, Safes, Vaults and Vault Doors.

Ask for Catalogues, Prices and all Information

# High Speed Vertical Engines



of the English enclosed  
type with pressure oil-  
ing system, installed by  
us at the

**Traders Bank, Toronto**

**Robb Engineering  
Co., Limited**  
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# Don't Scrap

the Old Machine. We'll repair or remodel it at a price much lower than a new one. It will give you just as Good Satisfaction and you can Pocket the Dollars Saved.

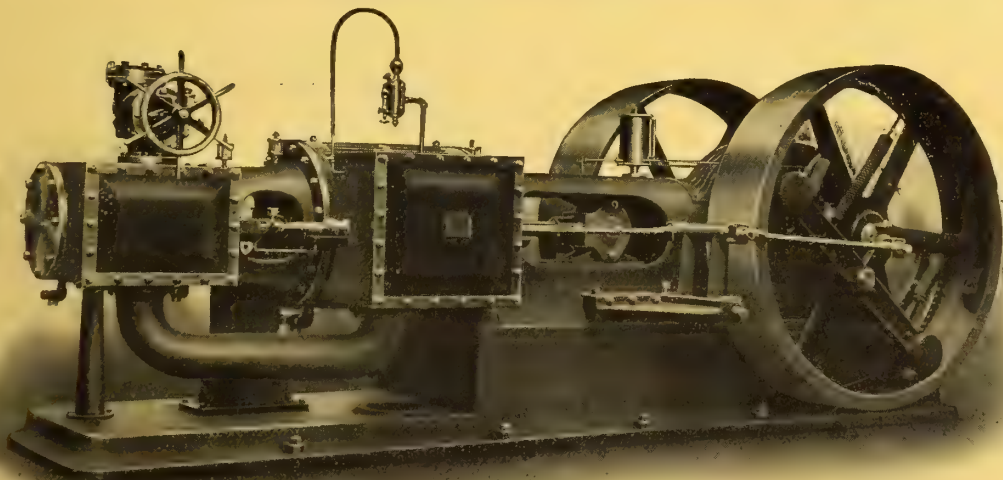
**The Specialists in the Cure of Electrical Diseases**

The  
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## **THE McEWEN HIGH SPEED AUTOMATIC** In Simple and Compound Units



Unexcelled  
for  
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*17-28 x 20 Tandem Compound.*

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**Waterous Engine Works Co.**  
BRANTFORD, CANADA

Just Back from Europe—and We are the Only House with a Full  
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## Glass Shades for Wolfram Lamps

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LONG DISTANCE PHONE MAIN 3149

# Electrical Repairs

We can keep you running while we make your repairs

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**MONTREAL**



VOL. XVIII, NO. 6

Canadian

JUNE, 1909

# Electrical News



HUGH C. MACLEAN, LIMITED.  
PUBLISHERS  
TORONTO — CANADA

MONTMORENCY FALLS

# New and Seasonable

A few additions to our line of

## Electric Heating and Cooking Appliances



**Co.Tec Percolators**  
1, 2 and 4 pint sizes

### Coffee Percolators

Extract the delicious flavor without the injurious elements

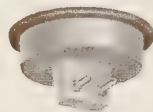
### Water Heaters

Clean, Safe and Durable. :: ::



**Water Heaters**  
1 pint and quart sizes

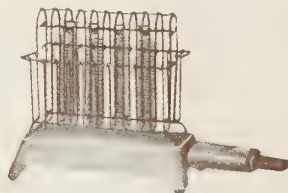
These appliances are fitted with **NEW STYLE HEATING ELEMENT**



**New Encased Flat Unit**

Self-contained and Easily Replaceable.

### Radiant Toasters



Produce crisp, delicious toast on the dining table fresh as it is required. :: :: ::

**All Models of Simplicity**

Have you investigated the possibilities of Cooking and Heating Appliances among your customers? A very complete Catalogue on these appliances, including Flat Irons, Radiators, Disc Stoves, Chafing Dishes, etc., mailed upon request.

# Canadian General Electric Co.

**Head Office : Toronto, Ont.**

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District Offices : Montreal, Halifax, Ottawa, Cobalt, Winnipeg, Vancouver, Rossland





# “That’s it!”

Treat yourself to a succession of agreeable surprises by investigating our line of

## Wireless Clusters and Lighting Specialties

Each one anticipates a particular need in a particular manner, and has a margin of excellence in design and construction which will please you, and simplify the problem of selecting your materials.

Our New Catalog C-19 has just been issued.  
Our New Tungsten Bulletin No. 4 is just off the press.

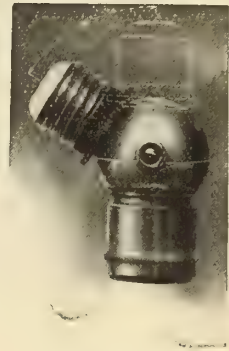
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Cat. No. 903  
ATTACHMENT PLUG



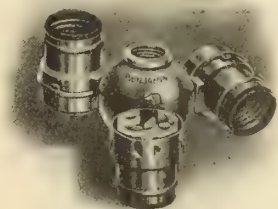
Cat. No. T 45K  
TUNGSTEN ARC



Cat. No. 99  
TUNGSTEN ADAPTER



Cat. No. 92  
PLUG CLUSTER



Cat. No. 853  
ADJUSTABLE SOCKET  
CLUSTER

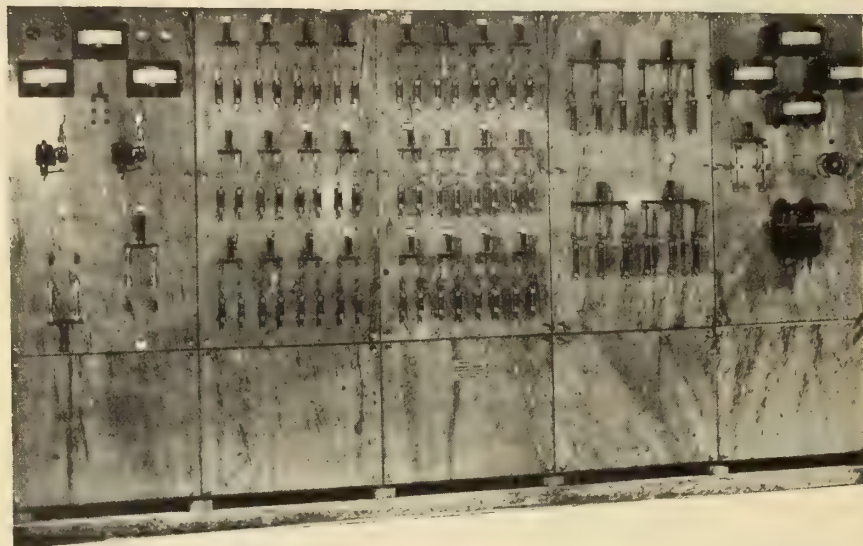
# Benjamin Electric Mfg. Co.

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# The Devoe Electric Switch Co.

157 Craig Street West, Montreal



Built by DEVOE for the Viau Biscuit Factory, Montreal

Manufacturers of  
High Grade

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**Steel Boxes**  
**Cabinets**  
**Etc.**

Quotations promptly made  
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submitted.

WRITE FOR OUR SWITCH CATALOGUE

## “DIAMOND H”

### SWITCHES

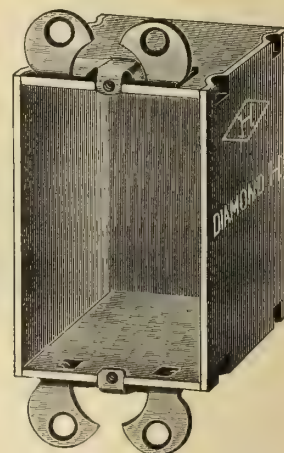
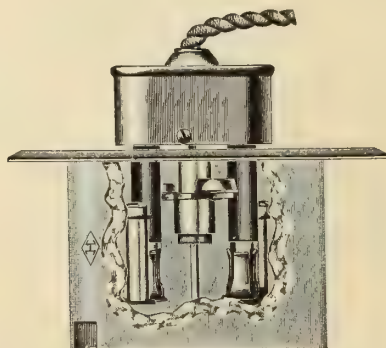
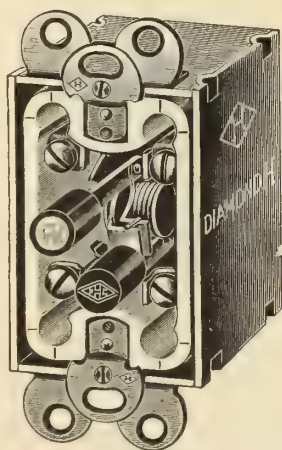
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



### APPLIANCES

Galvanized Steel all Cases  
Automatic Flush Receptacles and Plugs



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**Toronto Can.**



## W. T. HENLEY'S Telegraph Works Co., Ltd.

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**A. MACPHERSON & SON**

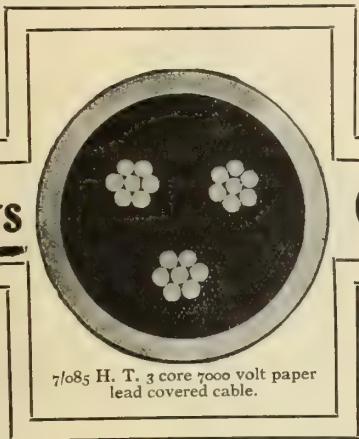
Coristine Buildings

Room 121

MONTREAL

Head Office:

Blomfield St.,  
London Wall,  
London, E.C.,  
England.



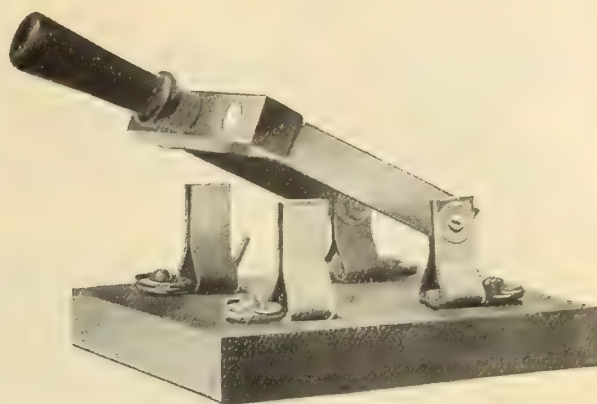
Works:  
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**Henleys**

**Cables**

## Insulated Wires and Cables

JOINTING MATERIALS



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25 Amperes at 250 Volts

**30 Cents Each**

Order at once.

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Limited

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In stock A. C. D. C.  
Portable Instruments

To read on both cur-  
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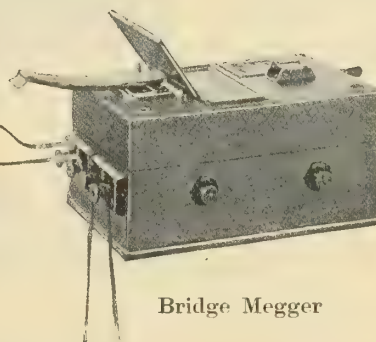
Inkless Recorders

Switchboard  
Instruments

Combined Feeder Logs



Resistance Box



Bridge Megger

How to Work  
see Instruc-  
tions in this  
Issue.

Showing Eversheds Bridge Megger giving standard ohm resistances from .01 ohm by fractions up to 9999. ohms, and upwards to 40 megohms. "No plugs, no batteries" direct reading.

Megger ranges from 100 up to 1,000 volts. 10 to 2,000 megohms. Large supply in stock, of all ranges, in Toronto.

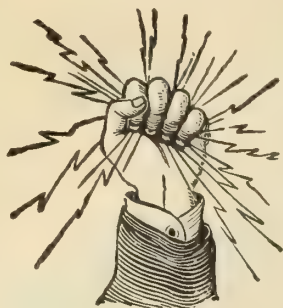
Used by the principal Canadian power and transmission companies.

**J. F. B. VANDELEUR, Dineen Bldg., TORONTO**

CANADIAN AGENT

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## Railway, Feeder and Trolley Wire

Electric Light Line Wire, Incandescent and Flexible Cords  
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## Bare and Insulated Electric Wire

Cables for Aerial and Underground Use

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# N. E. Code Standard Porcelain Bases

And Indicating Enclosed Fuses

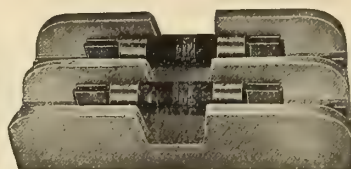


MAINLINE AND  
BRANCH PORCELAINS  
OF ALL KINDS



### NOTICE

The Lugs do not  
Project Beyond  
the Porcelain



We have dropped  
the use of castings  
in our Bases

HAVE YOU OUR CATALOGUE NO. 100?

# CHASE-SHAWMUT CO.

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# Stuart-Howland Company

Manufacturers of

The Most Symmetrical and Substantial Line of

## Street Railway Overhead and Pole Equipment

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Everything Fully Guaranteed

Also Dealers in Everything Electrical.  
Largest and Most Complete  
Line in the East.

261 Devonshire  
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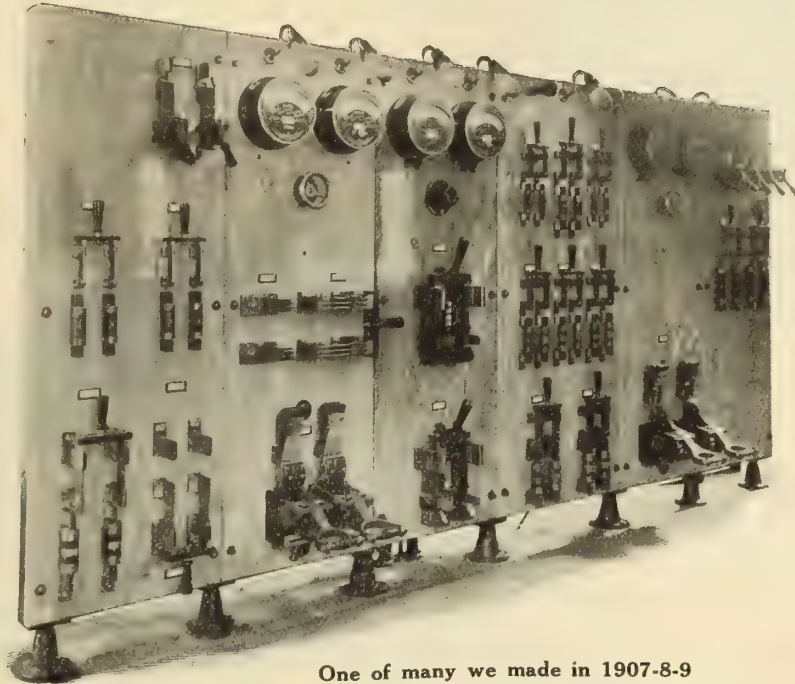
**Boston, Mass.**



# Monarch Electric Co., Limited

579 St. Paul Street, MONTREAL

Switchboards  
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2,000 Volt  
Motor Starting  
Apparatus  
Special  
Electrical  
Apparatus  
Commutators  
Sockets  
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One of many we made in 1907-8-9

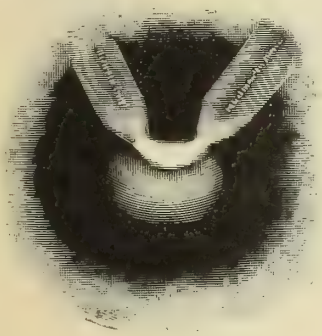
Special  
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Special Machinery  
designed or built to  
specifications.

Metal  
Novelties

We solicit an op-  
portunity to quote  
on your require-  
ments.



## "Fabius Henrion" Carbons

(MADE IN FRANCE)

Are Better Than Others  
Are Cheaper Than Others

In using them you get **straight** Carbons and don't have to pay  
**American Trust Prices** or **German Surtax**.

**We are an independent Canadian concern and don't soak you.**

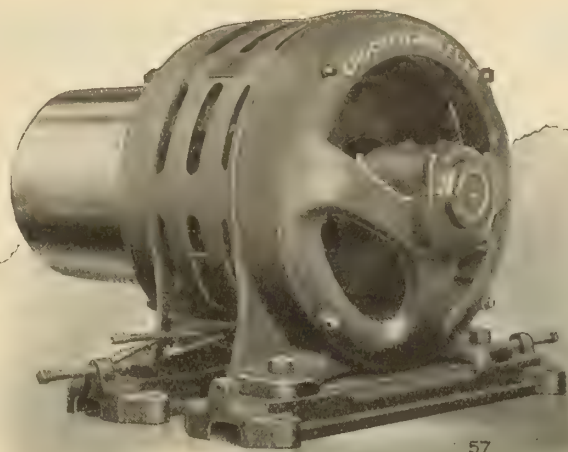
Free Samples of Carbons for Enclosed Arc Lamps, Flame Carbons, D.C. or  
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Prompt Shipments from Large Stock

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Every Carbon Bears the Name "FABIUS HENRION"—That's Enough



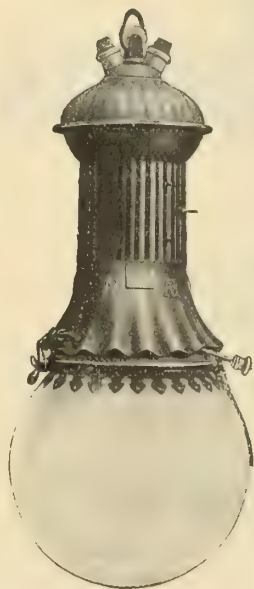
## Crocker-Wheeler Induction Motors

are just as good as Crocker-  
Wheeler Direct Current  
Apparatus. Could you  
ask for anything better?

# Canadian Crocker-Wheeler Co. Limited

MANUFACTURERS AND ELECTRICAL ENGINEERS

Head Office: 41 Street Railway Chambers, MONTREAL



## “The Light That’s Right”

The Adams-Bagnall Electric Co. make no other.  
Ask those who have used these Arc Lamps — We’ll  
take their word.

Write us for Bulletins

## Have You Tested Siemens Carbons Yet?

Better do this before purchasing your supply—other  
wise you will be sorry

Will we send you information and a few samples to try?

# The R. E. T. Pringle Co., Limited

Sole Distributor of Siemens Carbons

Winnipeg

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# Immunity from the Elements



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We are prepared to make lamps to the closest specifications.

Our

## **"Brilliant" and "Shelby"**

type are now very carefully selected and giving splendid satisfaction.

### SPECIAL PRICES

We have a surplus stock of nearly

**100,000 LAMPS**

**"EUREKA"** (Brilliant pattern) and **"ACME"** (Shelby pattern) which we are offering in case lots at special prices and extra discount for 1,000 lots one shipment. They are packed 250 per case 2 c.p. to 16 c.p. and 150 per case 32 c.p. Sold only subject to stock on hand.

All first class lamps. Send us your orders quickly, we'll do the rest.

## **Ontario Lantern & Lamp Co.**

Limited

**Hamilton, Ontario**



Dr. Kuzel's Patent

# "Kolloid-Wolfram"

TRADE MARK

## Tungsten Lamps

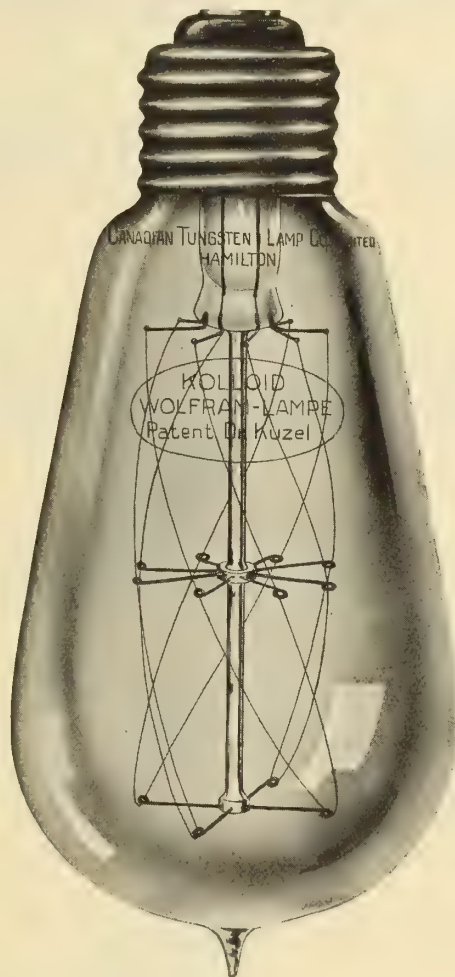
THE ONLY GENUINE ORIGINAL METALLIC FILAMENT LAMP

Whitest  
Light

Highest  
Efficiency

Lowest  
Wattage

Saves  
66  $\frac{2}{3}$ %  
Current



Average  
Life  
1000  
Hours

Burns  
Any  
Angle

Alternating  
or Direct  
Current

16, 20, 25, 32, 50, 75, 100 Candle Power, 110, 115, 120 Volts  
32, 50, 75, 100 Candle Power, 225, 250 Volts.

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# The Canadian Tungsten Lamp Co., Limited

Hamilton - Ontario

Operating the ONTARIO LANTERN & LAMP CO., Limited

# John Starr, Son & Co.

Limited

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Halifax, N. S.

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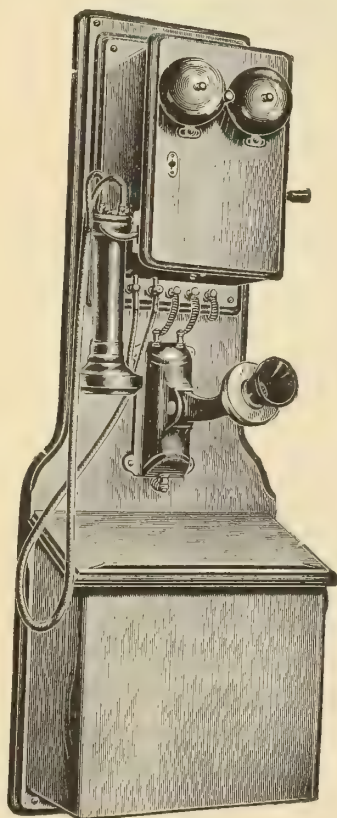
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The Standard  
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Largest Stock of Electric Supplies  
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Prompt Shipments

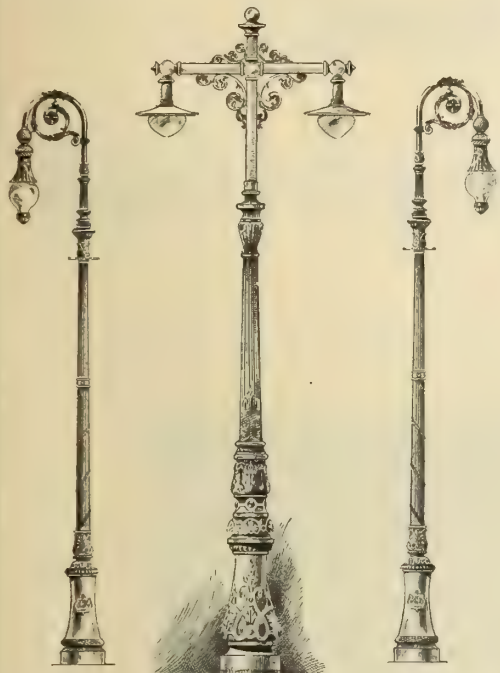
Lowest Prices

Send Us Your Enquiries

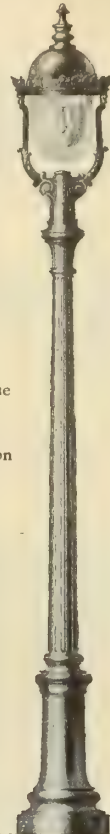


## MOTT'S Arc Lamp

## Poles and Electroliers

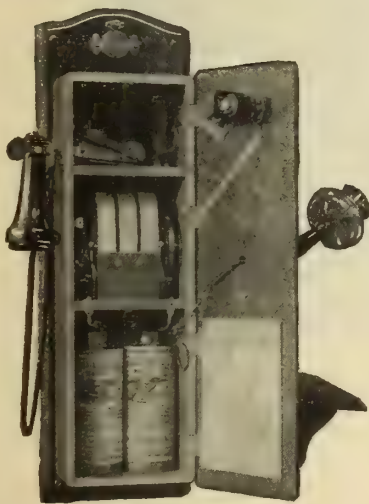
Arc Lamp Pole  
Design No. 1

Double Arc Lamp Pole

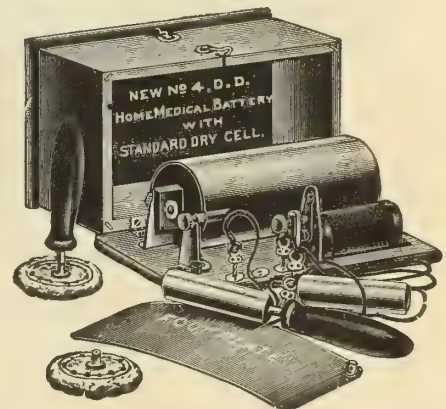
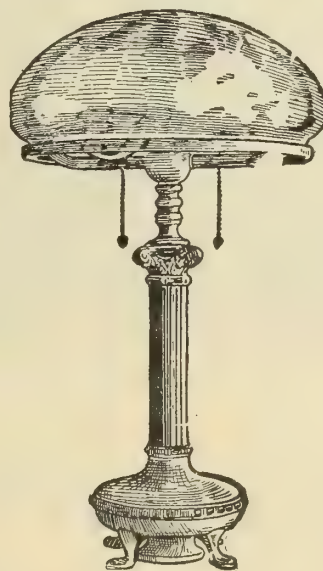
Arc Lamp Pole  
Design No. 1Catalogue  
on  
Application[Special]  
Designs  
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Design No. 1215JElectrolier  
Design No. 2012JElectrolier  
Design No. 1109J

The J. L. Mott Iron Works

83 Bleury Street, Montreal



Telephones



Medical Batteries

All Kinds of Electrical Appliances

of the very best, at lowest market prices

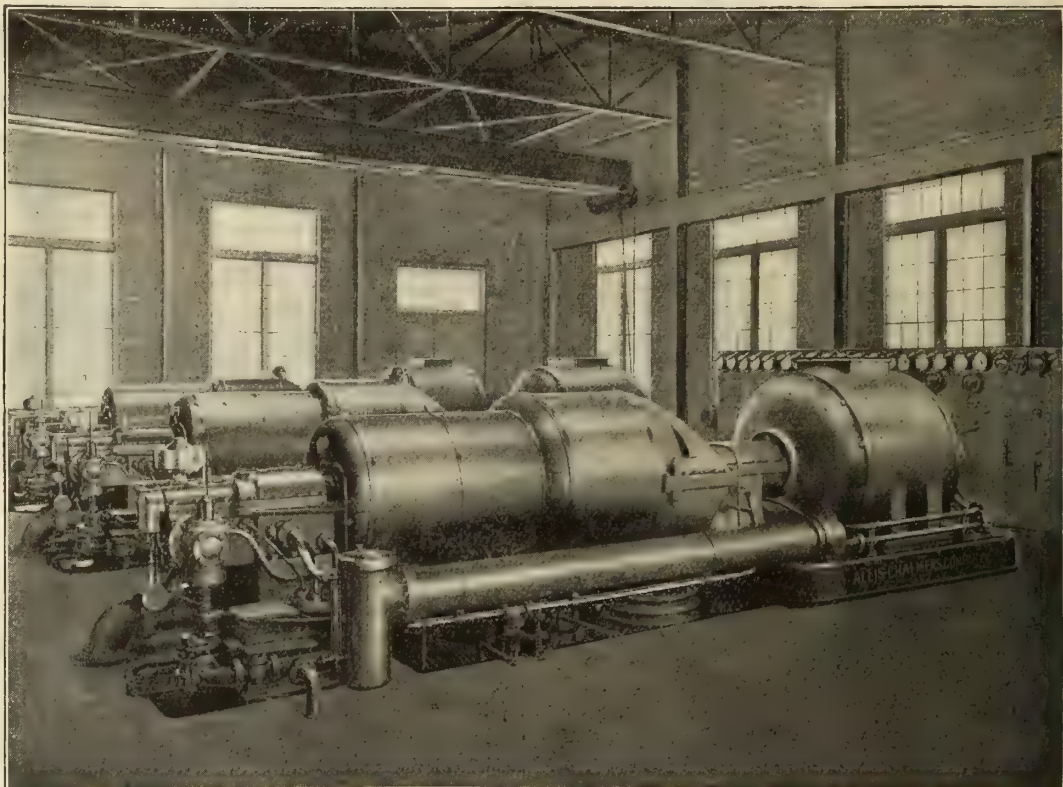
Correspondence solicited

Satisfaction guaranteed

Mechanics Supply Co. 80-90<sup>th</sup> St. Paul St. Quebec

# Steam Turbines and Generators

All Capacities from 300 K.W. to 20,000 K.W. — High or Low Pressure.



THREE 1,000 K. W. STEAM TURBINES AND GENERATORS IN THE POWER HOUSE  
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**See Bulletin 1054**

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LIMITED

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# Packard Transformers

## Specially Designed for Electric Furnace Work

The immense amount of electrical energy which is now at the disposal of manufacturers as a result of the development of water powers in Canada, has resulted in the application of electricity to many processes which were previously carried on by other methods.

A great impetus has been given to the art of electric smelting, and plants have already been established for the manufacture in commercial quantities of ferro silicon, calcium cyanamid and other products of the electric furnace.

The transformers required for this class of service must be of a different type from ordinary power transformers as the secondary voltage requirements necessitate special designs.

The Packard Electric Company, Limited, have given special attention to the design and development of transformers for electro smelting work.

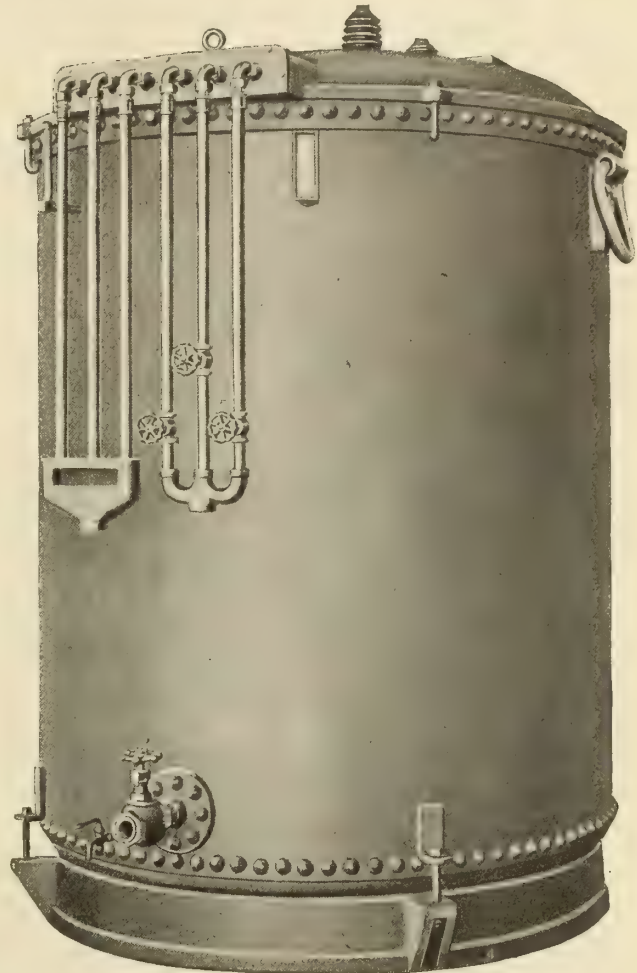
The construction of the Packard Transformer throughout, is of sufficient mechanical strength to withstand the extremely severe service required of it.

The eddy current losses have been reduced to a minimum.

The coil leads are so arranged that the maximum interlacing of conductors may be obtained, this being necessary to minimize the inductive drop.

Wherever the Packard Transformers have been installed, their performance has been so materially better than the specifications required, that we feel we require no further proof that we have developed a type of transformer especially adapted to electric furnace work.

We have issued a bulletin on this new Packard Transformer which should be in the hands of every electrical engineer in the country who is interested in this class of work. We will send a copy free on request.



800 K. W. Packard Transformer for Electric Furnace Service

### The Packard Transformer for Electric Furnace Service

Among other installations we have supplied seven of these Transformers for the Plant of the Electro Metals Limited, Welland, Ontario, of 750 K.W. each, on a primary voltage of 12,000 volts and secondary voltages of 20, 25, 30, 40, 50, 60, 80, 100 and 120 volts at a frequency of 25 cycles.

We also supplied fourteen Transformers to the American Cyanamid Co. of Niagara Falls, Ont., consisting of

Seven of 800 K.W. each, 12,000 volts to 55, 60 and 65 volts  
Four of 165 K.W. each, 12,000 volts to 65, 70, 75 and 80 volts  
Three of 85 K.W. each, 12,000 volts to 440 volts

These are designed for operation on circuit of a frequency of 25 cycles and primary voltages of 12,000, 11,700, 11,400 or 11,100 volts.

# The Packard Electric Co., Limited

Head Office and Works:  
St. Catharines

Branch Offices:  
Montreal - Winnipeg



The Duncan Electrical Co.  
Limited

Makers of

"Quality"  
Goods

# Electrical Supplies

Economy  
Specialties

Montreal

**THE BEST** By Test By Time By Trial



The Nearest Approach to Conduit Perfection Yet Attained

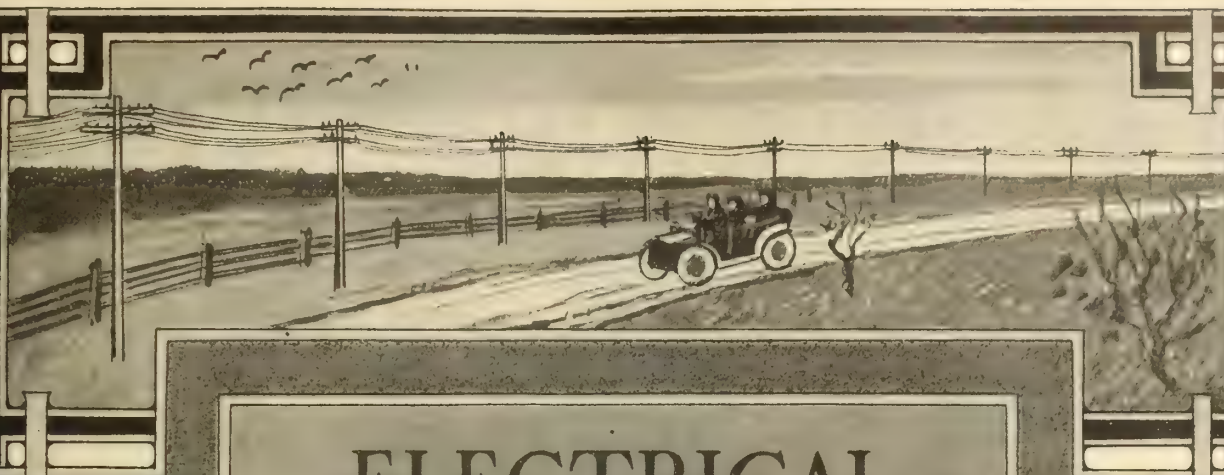


Second only to Galvaduct and Superior to any other Enamelled Conduit on the Market

A TRIAL ORDER WILL CONVINCE

**Conduits Company, Limited**  
TORONTO MONTREAL

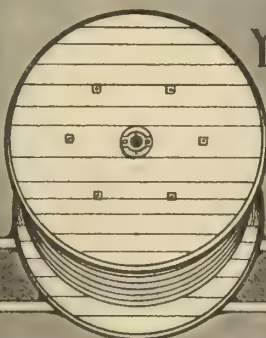




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Power Cables, Lead Covered Cables  
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Rubber Covered Wire  
Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
Switchboard Cords, Telephone Cords  
Etc, Etc, Etc,

LET US ESTIMATE ON



YOUR REQUIREMENTS

*The* WIRE & CABLE CO  
HEAD OFFICES . . . MONTREAL

A Revised Edition of  
Section one of our

## **Supply Catalogue**

is ready for distribution.

This catalogue includes  
a large number of new  
and attractive lines of

## **Bell Goods**

and

## **House Supplies**

Interesting prices will  
be quoted on application  
to our nearest office.

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**SECTION 1**  
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BATTERIES, BELLS  
HOUSE SUPPLIES

## **SUPPLY CATALOGUE**



**CANADIAN  
GENERAL  
ELECTRIC  
COMPANY  
LIMITED**  
**TORONTO**



# Separable Devices



Catalogue No. 6788  
Moulded Material  
Attachment Plug



Catalogue No. 6693  
Attachment Plug  
Porcelain



Catalogue No. 6791  
Attachment Plug  
Moulded Material

## A Perfect Contact Complete Line Carried in Stock

### Porcelain Attachment Plugs

For Ordinary Service, Portables, Flat Irons, etc.

### Moulded Material Attachment Plugs

For Laundries, Mills, Factories, etc.

### Combination Socket and Attachment Plug

For Attaching Fan Motors, etc., to Standard Outlets.

### Standard Receptacles, Cleat or Concealed

For Side Wall Work particularly

### Stage Lighting Plugs

Moulded Material—Exceptionally strong.

### Flush Receptacles

Substantially made and Highly Finished.



Catalogue No. 6797  
Combined Socket  
and Plug



Catalogue No. 6787  
Combined Socket  
and Plug



Catalogue No. 6792  
Side Wall Plug



Catalogue No. 6794  
Flush Receptacle

Prices and Samples upon Application

# Canadian General Electric Co.

Head Office: Toronto

Limited

Montreal

Halifax

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Winnipeg

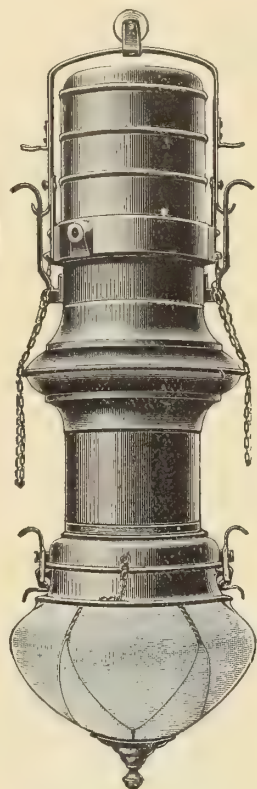
Vancouver

Rosland

# Engineering Equipment & Supply Co.

13 St. John St., MONTREAL

**"EXCELLO" Electrical Specialties**



## Mr. Central Station Manager

You cannot afford to overlook the importance of

# Flame Arc Lamps

Their use in your town indicates that you are strictly up-to-date.

We are the only firm in Canada specializing in this line and offer you the best product of the European factories.

Life per Trim  
10, 18, 35 Hours

Alternating or Direct Current  
All Frequencies

## ARC LAMP CARBONS

Highest Grade Imported

For { Flame Arc Lamps  
Enclosed Arc Lamps  
Projection Lamps

We are Direct Importers. If you are tired of paying fancy prices—WRITE US



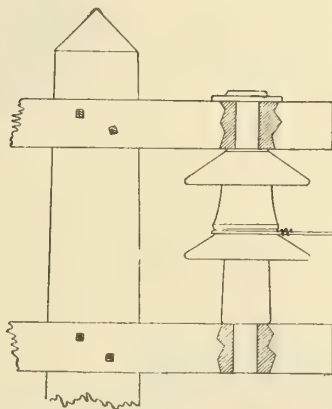
# Engineering Equipment & Supply Co.

13 St. John St., MONTREAL

**"EXCELLO"** Electrical Specialties

## **"VICTOR" Insulators**

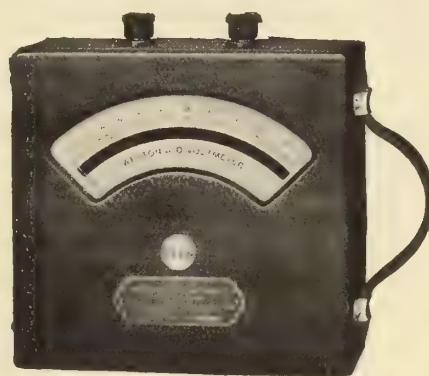
The Locke Insulator Mfg. Co., Victor, N. Y.



**INSULATORS** are the most important link in your system. By purchasing **"VICTOR"** you get the result of the accumulated experience of the world's leading engineers.

## **"WESTON" Instruments**

are absolutely reliable



New Models  
A.C. and D.C.  
Switchboard  
and Portable  
Types

Prices Right

Dead Beat

Accurate

## **"EXCELLO" Incandescent Lamps**

(TRADE MARK)

Carbon Filament  
Metal Filament

20, 25 and 110 Volt

Auto Transformers for Low Voltage Tungsten Lamps



### Type "A" Sign installed in Hamilton, Ont.

These letters are of prismatic glass, moulded in bold relief without any joints.

The new Type "A" signs are the most desirable signs.

#### BECAUSE—

They have a **day appearance** beautiful and lasting.

The smooth glass letters do not permit the dirt to settle and lamps and reflectors are enclosed from the weather.

They give a **perfect and brilliant effect at night** never before reached by any electric sign.

The average sign **costs but 1½ cents an hour** for current.

They are a **necessary equipment**—not an expensive luxury.

Letters furnished in all sizes from six inches to two feet inclusive.

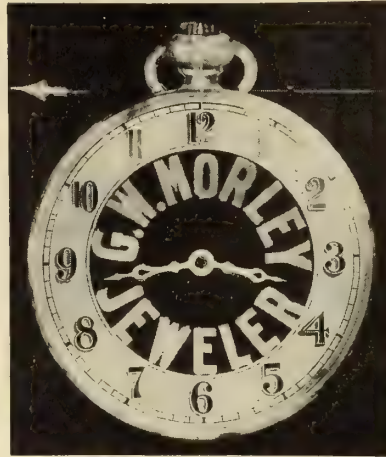
## The Flexlume Sign Co.

St. Catharines, Ont.

Limited

Toronto: The Standard Electric Company, Limited

## Central Station Men



The A. & W. One Light Signs are made to conform with all lines of business. The watch sign as above and, along the same line, a hat, a mortar, and a sign made with barber poles.

quickly realizing the advantages of our proposition have answered our former ads promptly. However, there may be a few stations we have not heard from. Should you be one, do not delay, give your stenographer a letter **NOW**, and let us fully explain to you the one great position

### The A. & W. One Light Electric Signs

They encourage the use of electric light. Put consumers on your line you otherwise never could get.

**THE ONE LIGHT SIGN** without question increases a firm's business and in consequence puts the electric light user above the standard of business men

Write us to-day, delay means direct loss to your station.

## The A. & W. Electric Sign Co.

56-64 Farley Ave, TORONTO

WE MANUFACTURE OTHER STYLE SIGNS

## Cedar Poles

from

### "British Columbia"

The strongest, straightest and soundest pole that grows in the "WORLD."

We can ship them East as far as Quebec and compete with Eastern poles—40 ft. and longer.

**In Ontario** we can compete only on 35 ft. poles and longer.

In Manitoba—30 ft. and longer.

In Alberta and Saskatchewan we are "IT" on all lengths.

Don't be afraid of them. They are the leading pole for City and Power line construction.

Yards on C. P. Railroad in British Columbia, Kootenay District.

We name delivered prices **always** and guarantee immediate shipment.

Write for car load prices on our **Oregon Fir Cross-Arms**.

The

## Lindsley Brothers Company

Spokane, Washington

## The Life of a System is the Life of its Parts

To have a perfect electric system, perfect supplies are necessary.

Our stock of

## Electrical Supplies

is known throughout the West for its excellence.

Our old patrons uphold us and the "old crowd" is rapidly growing.

Our location is such that we can make prompt shipment to any part of the West.

## The Washington Electrical Supply Company

Peyton Block, SPOKANE, WASH.



N. P. F. DEATH, B.A. Sc.  
Assoc. A.I.E.E.

LIONEL WATSON  
Assoc. A.I.E.E.

# Central Stations

You can boost your town and incidentally your lighting load by use of our

## Groove Letter Electric Signs

Properly designed illuminated signs beautify the streets of your town by day and light them at night.

They give the town a business like, alive, progressive and prosperous appearance. The whole town wakes up and the Central Station is the first to feel the awakening.



A Few of Ours



This writing sign was designed and built by us for Chas. C. Cummings, Ltd. It contains 304 lamps and 194 circuits

We build all sizes of electric signs from a small transparency to the largest and most complicated flashing roof sign.

Our flashers are designed and built in our own factory and we are therefore prepared to stand by them.

Our groove letter is the most legible and can be read at a greater distance than any other on the market.

Write us for suggestions and call at our office when in Toronto.

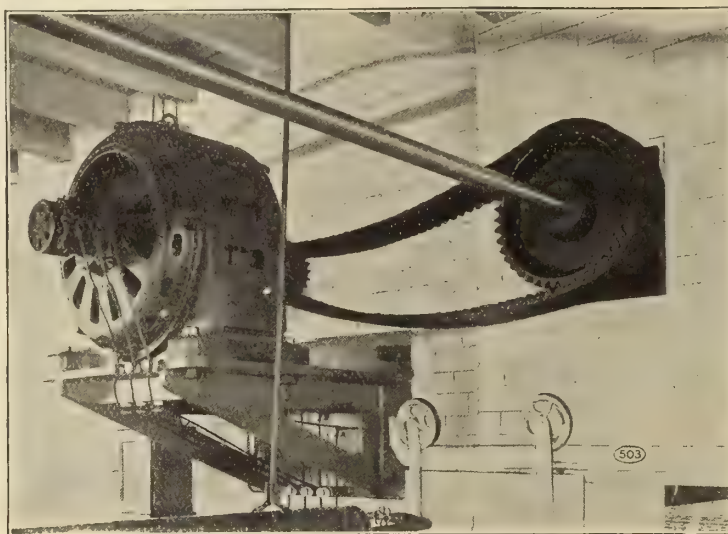
## Death & Watson

Electric Sign Manufacturers

25 Jarvis St., Toronto

# Renold Chains

for  
Line Shaft  
Driving  
from  
Motors



Convenient  
Reliable  
Efficient  
Durable  
Increased  
Output

This Drive will cost you one and a half  
to double a similar Belt Drive in first cost

BUT—

1. **Efficiency.**—Puts 98 per cent. of the power of the motor into line shaft.
2. **Economy.**—Saves its first cost in a year or two by overcoming the loss by slip in belt drives from motors.
3. **Reliability.**—Adopted by the leading steam engine builders to drive the governors of the largest engines, as it can be absolutely depended upon.
4. **Durability.**—The works of Hans Renold, Limited, are about half belt and half chain driven, and they find the chains outlast a couple of belts, but with the new improvements recently made will probably do considerably better than this.
5. **Saving in Space.**—Chain sprockets are 30 to 50 per cent. less in diameter, 50 to 80 per cent. less in width, and it is the only drive suited to short centres.
6. The only satisfactory method where oil, moisture or heat are present.
7. **Production.**—Owing to the steady positive drive, machines can be considerably speeded up, giving a larger and better product. In several large works this increase amounting to over 20 per cent.
8. We now have a number of business friends in Canada who after giving the chains a trial, are enthusiastic supporters.

\$3,000 gained yearly in our shop by Driving Line  
and Countershafts through Renold Silent Chain

## JONES & GLASSCO

Canadian Agents

-

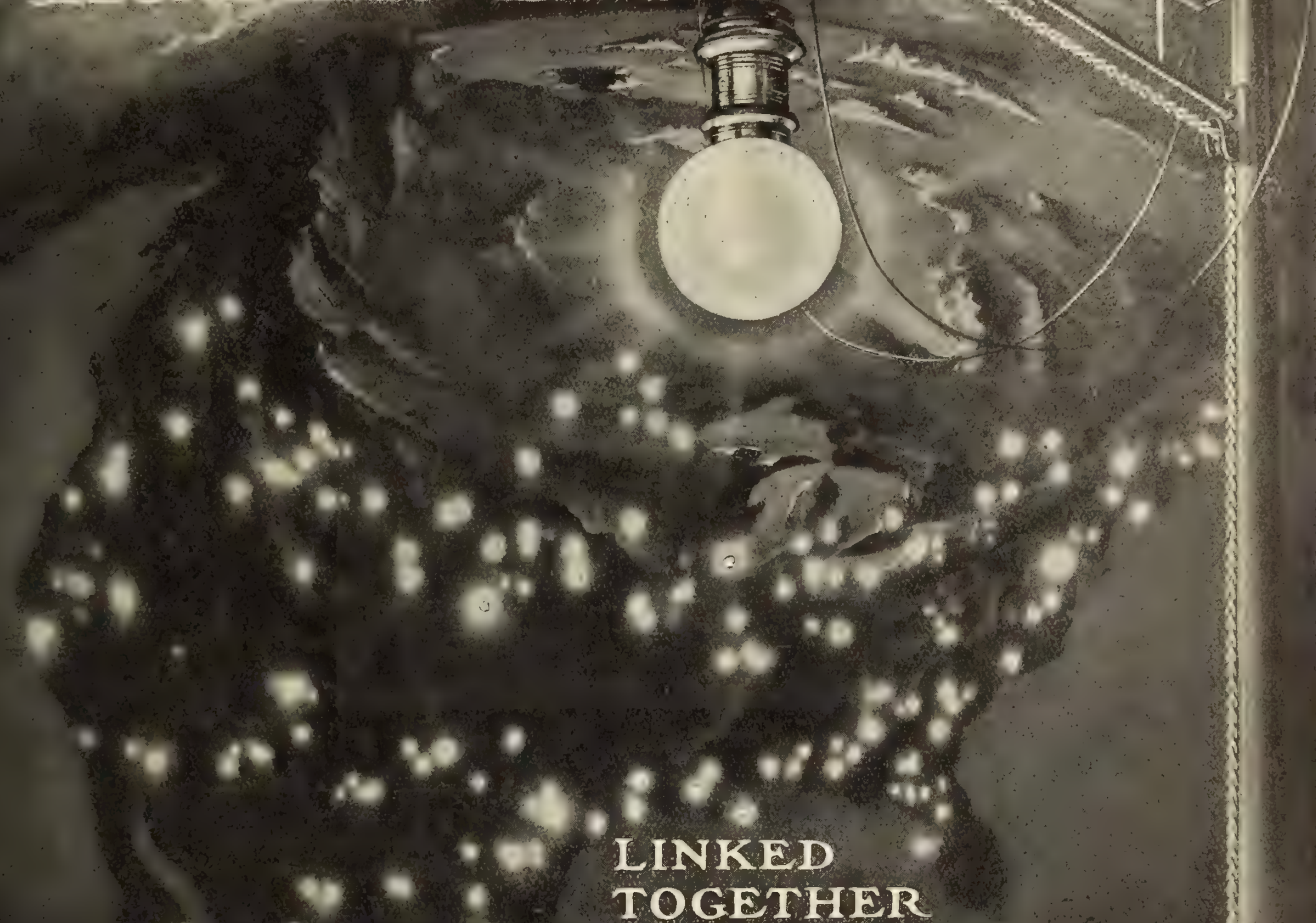
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MONTREAL



# From ATLANTIC & PACIFIC

A CHAIN OF BRILLIANTLY  
ILLUMINATED CITIES



LINKED  
TOGETHER

## By ONEIDA GALVANIZED CHAIN For Arc Light Suspension

**T**HOUSANDS OF LIGHTS in a thousand different cities attest to its practical effectiveness.

**I**t is heavily galvanized, therefore absolutely rust-proof. Impervious to ice and sleet. Uniform in strength. Perfectly flexible. *Will outwear cord, cable or rope many times over.*

ONEIDA COMMUNITY, Ltd.

MILLIONS OF FEET IN USE

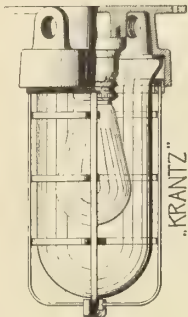
NIAGARA FALLS, ONTARIO.



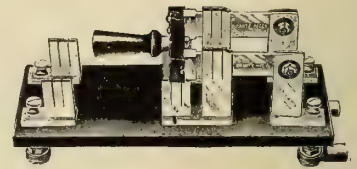
# H. Krantz Mfg. Co.

Specialties

## Switchboards Panel Boards

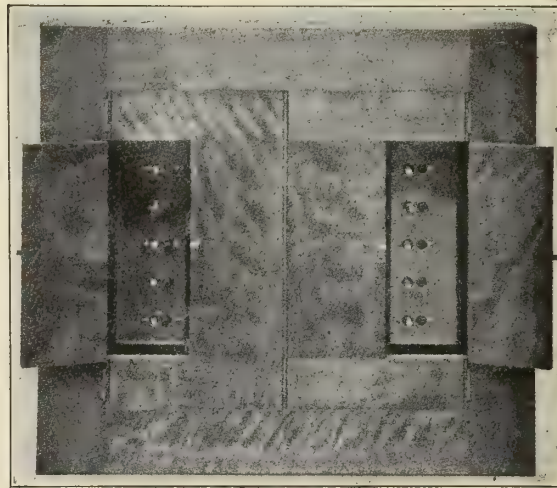


Lamp Guard  
Boxes for Water-  
tight Installations.



Knife Switches  
for any class of service

For Switchboard Work.  
For Entrance Work.  
For Light or Power Work.



Type M. Safety Switch Panel  
(Patented)

The following are a few representative buildings, etc., in the Dominion  
where "Krantz" material has been installed :

POST OFFICES	Vancouver, B.C.	Ottawa, Ont.	Examining Warehouse, Quebec
	St. Johns, Que.	Quebec, Que.	Renfrew Theatre, Renfrew, Ont.
	Hochelaga, Que.	Windsor, Ont.	Mail Job Printing Building, Toronto, Ont.
	Yarmouth, N.S.		Mossops Hotel, Toronto, Ont.
	The Government Printing Bureau, Ottawa, Ont.	Don Valley Paper Mill, Toronto, Ont.	St. Michael's Cathedral, Toronto, Ont.
	The Government Experimental Farm, Ottawa, Ont.	Robert Simpson Co., Toronto, Ont.	Etc., Etc., Etc.
	House of Commons, Ottawa, Ont.		
	Custom House, Quebec.		

Floor and Outlet  
Boxes for any Elec-  
trical Installation  
purpose.

Get in touch with the BEST there is

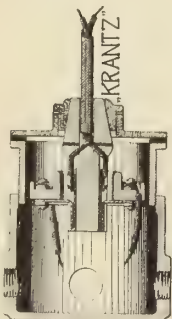
Write

## C. H. L. Keeler Co.

Canadian Agents

511 Continental Life Building - Toronto, Ont.

Watertight and  
Non-Watertight  
Portable Lamp  
Guards.





# "I-COMFORT" SYSTEM

a practical, efficient method of  
**Indirect  
Illumination**

This system affords a nearer approach to daylight than any other method of artificial illumination, with a current consumption no greater than for the systems of direct lighting now in general use.

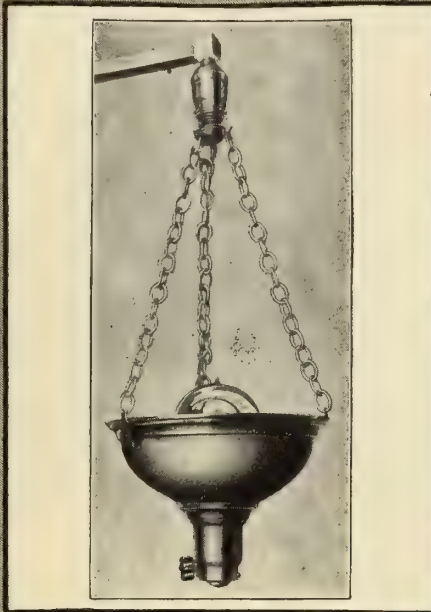
This is the long-looked-for comfortable lighting system. Our developments have made it commercially available—i. e., within the reach of persons of moderate means.



The lights are entirely concealed by inverted reflectors of special design, set in neat brass receptacles.

There is no blinding glare—no lamps in sight—just an even reflected light, wonderfully free from shadows and evenly distributed.

One 60-watt Tungsten lamp gives ample illumination in the room illustrated



Room illuminated with single fixture containing one 60-watt Tungsten lamp

In use for months in residences, offices, halls, assembly rooms, etc., the "I-Comfort" System is already well past the experimental stage, and has conclusively proven itself to be the most efficient means of eliminating the one obstacle to the free use of Tungsten lamps—the blinding glare of the naked filament.

Central Station men enthusiastically endorse this method.



Jobbers and fixture manufacturers! be the first to present this in your territory.

One for your own personal use will make you an enthusiastic booster of the "I-Comfort" System of illumination.

Write to-day for further information and details.

PATENTS APPLIED FOR.

**The National X-Ray Reflector Co.**  
247 E. Jackson Blvd., Chicago, Ill.



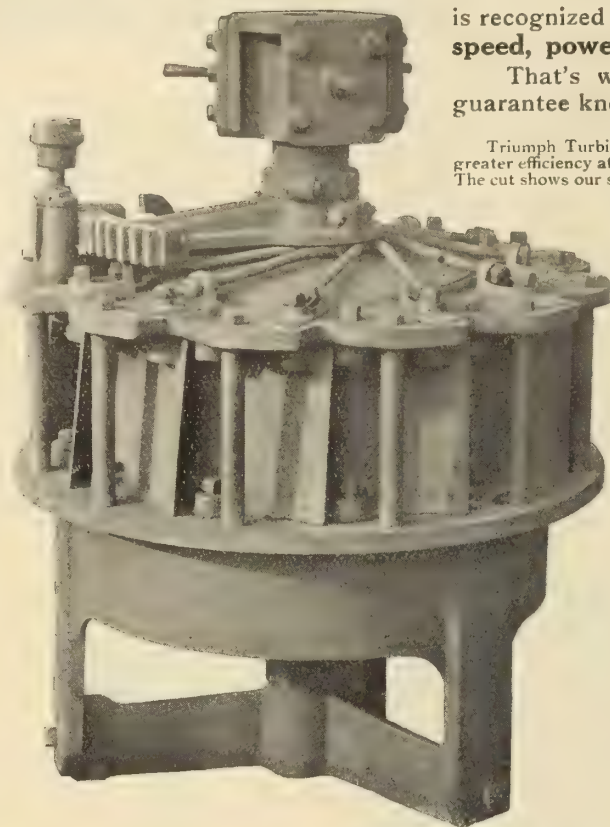
# The Triumph Turbine

is recognized as the most efficient water wheel made for **speed, power and high efficiency.**

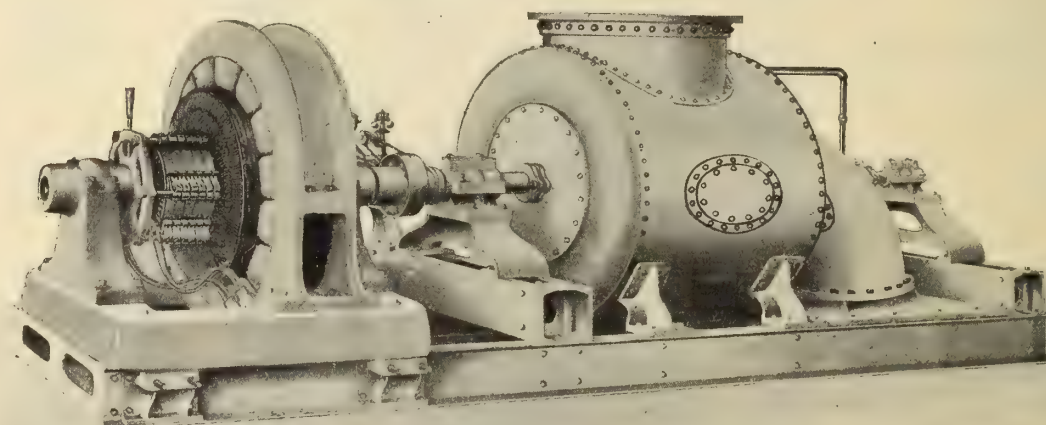
That's why we are able to back it with the best guarantee known to engineers.

Triumph Turbines will furnish more power according to diameter, and give greater efficiency at all stages of gate opening than any other turbine on the market. The cut shows our standard style with vertical shaft. The runner is a single downward discharge, conical in shape, and the buckets are wrought steel with cast iron band around outside. The gates are of the butterfly type and set on the same taper as the runner. It works equally well in a horizontal position.

SEND  
FOR CATALOGUE



WHEEL CONNECTED DIRECT TO DYNAMO



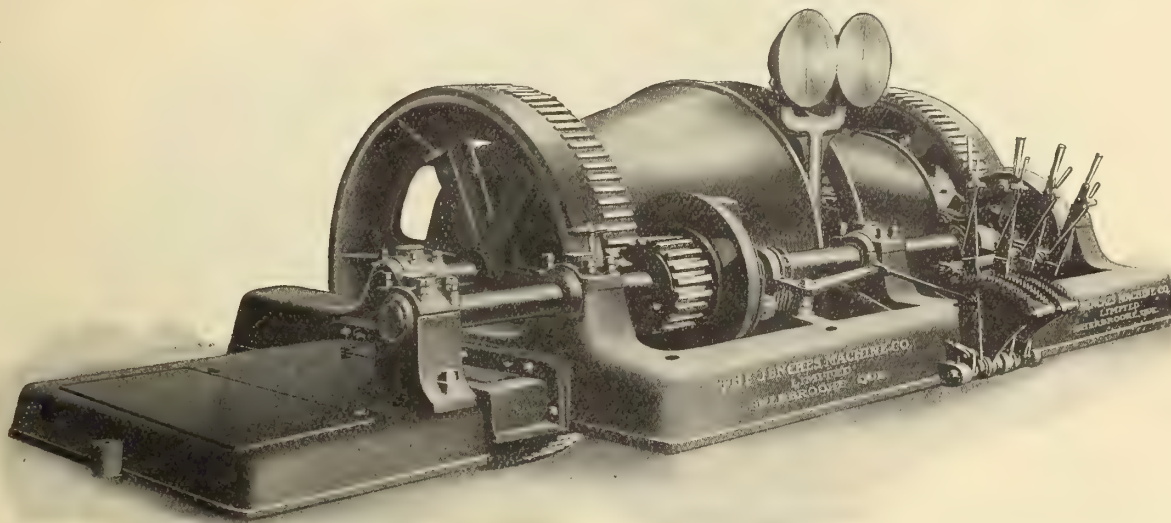
This cut illustrates one of our wheels in Steel Flume, the shaft being direct connected to dynamo beside the wheel. The whole outfit is mounted on the one base, made of steel I beams, and is as rigid as it possibly can be made. All end-thrust of the wheel is taken care of by our improved thrust bearing. There can be no vibration in a setting like this, and the governor, mounted on the same frame regulates the speed perfectly. We consider this an ideal setting.

We also manufacture a complete line of Iron and Steel Flumes, Penstocks, Gearings, Water Wheel Governors, Brass and Iron Castings, Power Transmission Machinery

**The Madison Williams Mfg. Co., Limited**  
Lindsay, Ontario, Canada



# Electric Hoists



We build a full line adapted to every class of Hoisting Service, and complete with Motors when desired.

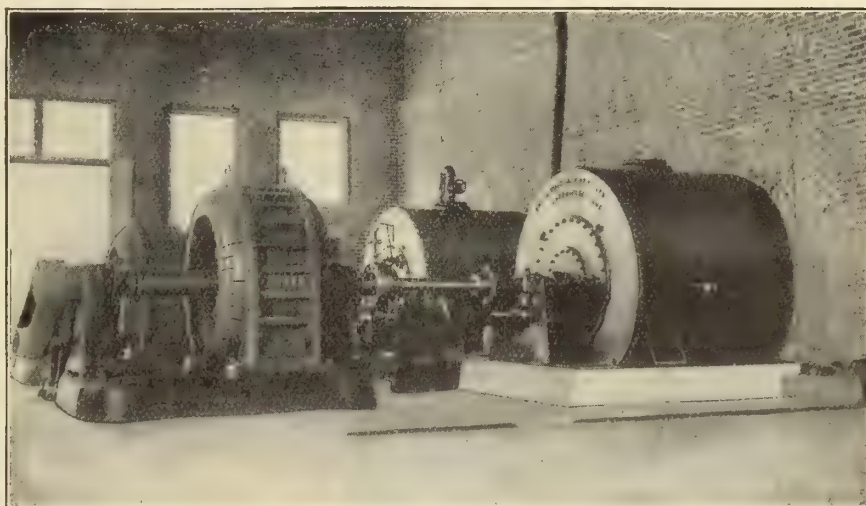
We have had a large experience in Electric Hoist building and fully guarantee each machine.

## Turbines

for

## Hydro-Electric Plants

### Our Specialty



Our new Improved Turbines are particularly adapted for Hydro-Electric Installations and are now fitted with our new Balanced Gate which we want you to investigate.

Maximum Power and Efficiency guaranteed.

Call or Write Us for Catalogues and Full Particulars

## The Jenckes Machine Co., Limited

Sherbrooke, Montreal, St. Catharines, Cobalt, Vancouver

Works: Sherbrooke, Que., St. Catharines, Ont.

# McCormick and Smith Turbines

both **cylinder** and **wicket** gate, giving enormous power, are used in hundreds of electric power plants through the world,

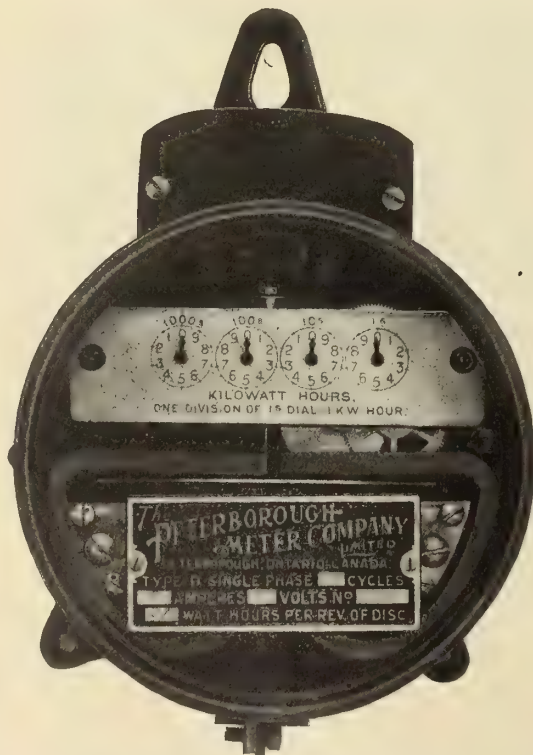


Nine Quadruple Turbines aggregating 53,000 H.P. are operating generators in the plant of the Winnipeg Electric Railway Company, Winnipeg, Manitoba

We make specialty of designing turbines to meet the requirements of the public. We desire to hear from people who are contemplating installing of turbines to operate under **low, medium** or **high** heads.

**S. MORGAN SMITH COMPANY - York, Pa. U.S.A.**

Branch Offices: 176 Federal St., Boston, Mass. 644 American Trust Bldg., Chicago, Ill.



**Can Ship Immediately**

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent. overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

# John Forman

Electrical Supplies

248-250 Craig Street West, Montreal, Que.



# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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Subscribers are requested to promptly notify the publishers of failure or delay in delivery of the paper.

### EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

The "Canadian Electrical News" is the official paper of the Canadian Electrical Association.

## The Central Station and the Tungsten Lamp

Central station managers as a whole are not giving the tungsten lamp question the consideration that it merits. Many have realized the importance of thoroughly testing the lamps, but there are still a few on the fence who are inclined to regard the lamp as a fad that will never command the market, but will rather float off the electrical map as rapidly as it appeared. It is perhaps well to be guided on this question by your predecessors' experience with the carbon lamp. It, too, was lightly considered at first and openly scoffed at by many conservative electricians. The outcome of this was that the manufacturer in order to make a sale for his goods was forced to sell to people who neither knew nor cared about that quality known as efficiency, but who were concerned only with profit. To their order was made the cheap carbon, larger power consuming lamps which did so much to place electric light in bad repute with users in those early days.

Don't let history repeat itself. There is a good thing in the metallic filament lamp for central stations, al-

though that fact may not be apparent on the surface. For a time your lamp load may decrease, but the larger field for extension will soon overcome this set back. The cheaper current supply will enable you to wire up many customers to whom the rates have formerly been prohibitive. However you are not dependent on your load regaining its normal from this source, for there is a large field waiting to increase your meter readings in the requirements of power for domestic purposes. There are innumerable devices on the market that are rapidly becoming household necessities, and their number is being constantly added to. They will all add to your load and are the more desirable since they are largely non-peak load consuming devices.

A leading lighting firm in one of our largest cities has taken hold of the tungsten lamp in earnest and have opened a demonstrating department on one of the prominent streets. Here a capable lecturer explains the advantage and cheapness of these lamps. This company gives to the customer the option of either buying the lamp outright or paying a small monthly rental. The firm has the reputation of "getting in right," and the fact that they have taken the tungsten lamp as a serious proposition should lend confidence to those who hesitate and cannot finally decide to handle them. This is the age of tungstenism, and the time to "get busy" is the present.

## The Electrical Casualty List

No one can justly accuse Canadians of indifference towards the sufferings of unfortunate fellow-beings. Yet we remain calmly indifferent to the suffering and deaths that are daily occurring in our midst in the industrial field. In electrical operations the extent of deaths due directly to inadequate protection to the workingman and the public generally have grown to such an extent that measures should be at once taken to lessen this menace to human life. By a plan proposed by the Hydro-Electric Commission, when a wire falls it will no longer carry current, and will be thus rendered harmless. This is a move in the right direction.

Past experience with civil authority has taught us that to invoke their aid would be a slow and tedious process of readjusting conditions. Nor is help to be expected from the central station. As it is, their troubles are legion, and legislation must come from a higher court.

It is essentially a question for the National Underwriters' Association. The position which the National Code occupies in the electrical universe makes it the proper channel through which should flow the legislation upon this important subject of life hazard. Theirs is the only standard wiring code, and in supplying it, although concerned from a business standpoint with the fire hazard only, should they not be prepared to assume some of the responsibility for the protection of human life and add preventative measures to the code where possible? Let the underwriters take up this matter and legislate favorably and the world will owe them a debt of lasting gratitude.



# The National Underwriters Rules and the C. E. A.

## Suggested Amendments to Prevent the Theft of Current—Canadian Electrical Companies should have a Voice in Revision of National Electrical Code

When the Canadian Electrical Association convenes in Quebec no subject should be discussed with more general interest than the topics advanced by the committee on stealing current. Perhaps American companies are more or less immune from this class of loss on account of the more general use of underground systems, but there is no phase of electric light economy that is more keenly felt by the large producers of electricity in Canada than current stealing. The extent to which it is carried on in some of our large cities is remarkable, as shown by evidence only secured through the medium of a Sherlock Holmes method of detection. Many people to-day will get ahead of a company, oft times by very questionable means, and consider it rather a test of their cleverness than as a crime punishable by law.

The point arises, is the central station man to remain subject to these continued losses. It is a question for the C. E. A. to busy themselves with and take such measures as are possible to lessen this growing evil. The lighting companies themselves have been backward in making complaint, probably on the ground that it would suggest to other unscrupulous persons a method of getting something for nothing. In one instance, however, a company publicly threatened the perpetrators with impending charges, with the result that they had the satisfaction of seeing a perceptible decrease in the current stealing habit.

Mr. A. A. Dion, a past president of the Canadian Electrical Association, and general superintendent of the Ottawa Electric Company, has been foremost in furthering a movement to remedy the existing evils. Current steals are often carried out by the use of a jumper attached from the main switch and cut out out to the distribution blocks, thus short-circuiting the meter, the switch cut-out being in front of the meter, as necessitated by the code standard enforced by the Canadian Fire Underwriters' Association. Mr. Dion's proposal at first was to put the meters ahead of the main switch, so that no connection could be made ahead of the meter without leaving a noticeable trace, but this method was soon stopped by the Underwriters, who objected to it as contrary to rule No. 22, which states that nothing must be ahead of the main cut-out and switch. Next, some of the things advertised to prevent stealing, such as boxes to fit over the meter connections, were tried, but it was found that nothing of that kind would be of real use except to cover and seal the main cut-out and switch. This was impossible, since the customer must have access to his main switch and main fuses. Mr. Dion, together with Mr. J. J. Wright, of the Toronto Electric Light Company, then interviewed Mr. H. F. Strickland, chief electrical inspector of the

Canadian Fire Underwriters' Association, and placed before him a request that a ruling be given interpreting the code in such a way that the meter might be connected near the point of entrance and ahead of all switches and cut-outs, provided that the shunt wire was brought down from the meter and connected to the circuit inside of the main switch and main fuses.

The underwriters referred the matter to the Underwriters' National Electric Association for consideration. Mr. Strickland was favorable to the amendment and strongly emphasized the advantage of the C. E. A. sending a representative to the yearly conventions of the Underwriters' National Electric Association, by whom the code rules, for Canada as well as the United States, are drawn. As a result of a correspondence between Mr. Dion and Mr. C. M. Goddard, secretary of this association, an invitation was extended to the C. E. A. to send their representatives to the meetings of the Electrical Committee. At the meeting in New York of this association during the last week in March Mr. Strickland introduced the proposed amendment to the Code, and it came in for a large share of discussion. The meeting was unable to settle it, and finally referred it to the Electrical Committee for investigation. Much opposition was made to the amendment by various parties, who complained that they had no sooner marketed devices for the prevention of current stealing than the rule making them necessary was struck off, thereby losing for them all their labors.

It seems only fair that the Canadian Electrical Association, governed as it is by the American code, should have some say in the make-up of the rules, instead of being content to accept without a murmur everything that becomes law. It is for the members of the society to come to the Quebec convention to discuss this question in all its details, and be prepared to say whether the time is ripe for the society's voice to be heard at the Underwriters' National Electrical Association's meetings of the future. Does it not sound reasonable that if we send a representative, with a statement of desirable amendments from the different members, that we would be making our association of more value and that many more companies would be induced to join? There should be developed amongst the central station managers in Canada a spirit of alertness and watchfulness over the actions of the Underwriters' National Electric Association, and their voices should be heard as well as other associations, in all future discussions of the code.

While discussing this question, the practice on the part of wiring contractors of disconnecting meters when they are re-wiring or altering buildings, should be investigated.





A View of the taking of Quebec, September 13th, 1759.\*

## Historic Quebec — Its Interest and Romance

### Places of Attraction in the City selected for the Nineteenth Convention of the Canadian Electrical Association—Program and Entertainment Features

In quaint, curious old Quebec, whose winding streets and battlements are pervaded with the atmosphere of departed centuries, will be held the nineteenth annual convention of the Canadian Electrical Association. One cannot but feel that the association has made a happy choice in the selection of this fine old city as the meeting place. The programme gives promise of a splendid convention, and together with the attractive features which Quebec offers, there should be a record attendance when the opening address is made at the Chateau Frontenac. It is now seven years since the association held a convention in Quebec city, and well do those members who visited the city then, know the charms of the place.

Quebec is one of the most interesting places on the continent, and last year the centennial celebration held to honor the memory of the great Champlain, attracted visitors by the thousands. No where on this continent will you find such interesting remnants of mediæval days side by side with such up-to-date features as electric cars and modern electrical developments. With modern progress some of the old landmarks have disappeared,

but enough has been preserved to gratify the interest of the visitor.

The ancient city of Quebec was founded by Champlain in 1608 and remained under French rule until 1759. On the 13th of September of that year was fought the renowned battle between the French and the British in which both commanding generals were slain on the field, the British finally being victorious, resulting in Canada's cession to England. Monuments to the memories of both Wolfe and Montcalm have been erected. The British immediately turned their attention to the defence of the city, and from its commanding position and the strength of the fortifications since constructed, it has been not inaptly termed the "Gibraltar of America."

The view of the city, as approached from the river, is singularly impressive. The city consists of two divisions, known as the Upper and Lower Towns. The Upper Town includes within its limits the Citadel of Cape Diamond, which covers the entire summit of the promontory, embracing an area of more than forty acres. It rises to a height of 345 feet above the level of the

\* Reproduced from an old print owned by Capt. Chas. J. Catto, Toronto.



river. Jutting out along the brink of Cape Diamond, 200 feet above the roofs of the quaint Lower Town of the old city, is the Dufferin Terrace—a Government-built promenade which takes rank with the Hove Lawns and Esplanade at Brighton, England, as the resort of beauty and fashion, and far surpasses almost any promenade in the world in the tremendous panorama that it commands. At the eastern end of this promenade rises the beautiful pile of the Chateau Frontenac, while the west end is under the shadow of the grim fortress known as the Citadel, from which floats the Union Jack, symbol of Empire and of which none are more proud than the people of Quebec. The view from the Citadel, owing to its great elevation, is surpassingly grand and comprehensive. The majestic St. Lawrence, alive with sailing craft of every kind, stretches before the vision in both directions. Directly below lie the crooked streets of the Lower Town. To the east are the Plains of Abraham, together with the bluffs scaled by Wolfe and his brave soldiers in the preparation for the assault that ended in victory.

The shape of the city is triangular, the St. Lawrence and St. Charles rivers forming the two sides, with the Plains of Abraham as the base. The river fronts are defended by a continuous wall on the very brow of the cliff, with flanking towers and bastions, loop-holed for musketry and pierced for cannon. On the west side a heavy triple wall, with trenches between, formerly guarded that approach, but much of it is now demolished. The numerous ancient gates, churches, colleges, and public buildings of interesting architecture, pretty private residences, together with other features of in-

terest, give the city a distinction which is bound to entertain and please the visitor.

#### **Shrine of St. Anne, Montmorency Falls**

The surroundings of Quebec are equally as attractive as the city proper. Directly across the river is the city of Point Levis. The Isle of Orleans, a few miles distant, may be reached by ferry, and affords delightful drives. Perhaps the most interesting point is the Falls of Montmorency. The river of that name was the scene of the battle of Montmorency, which immediately preceded Wolfe's final victory at Quebec. At the falls the water pours over the cliff into the St. Lawrence, a depth of 250 feet, broadening at the edge to about 50 feet. It is here that the famous shrine of St. Anne is located. The shrine is said to have been founded in the early years of the 16th century by a crew of Breton sailors, whose vessel had been buffeted about in a terrific tempest on the St. Lawrence. During the summer they solemnly vowed to build a shrine in honor of the patron saint of their dear Brittany, Ste. Anne d'Aurey, the mother of the Virgin Mary, should she guide them safely through the dangers encompassing them. They landed safely, and built a small wooden chapel in fulfilment of their vows. The primitive little church was replaced by a larger structure in 1660. This was subsequently enlarged, and after about a century's existence, it was almost entirely rebuilt in 1787 and 1788, and converted into a chapel—still occupying its original site near the "sacred spring," whose waters have, it is claimed, miraculous properties. Across the street, in contrast to this unpretentious building, is the magnificent edifice which although opened for public worship in 1876, and raised to



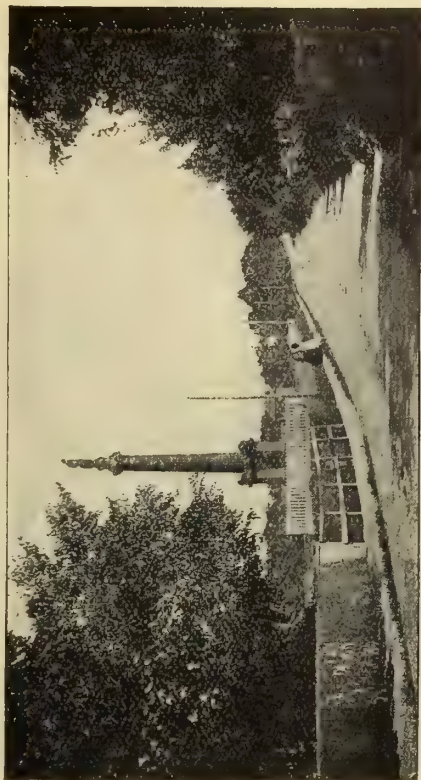
Chateau Frontenac, Quebec—The C. E. A. Convention Headquarters



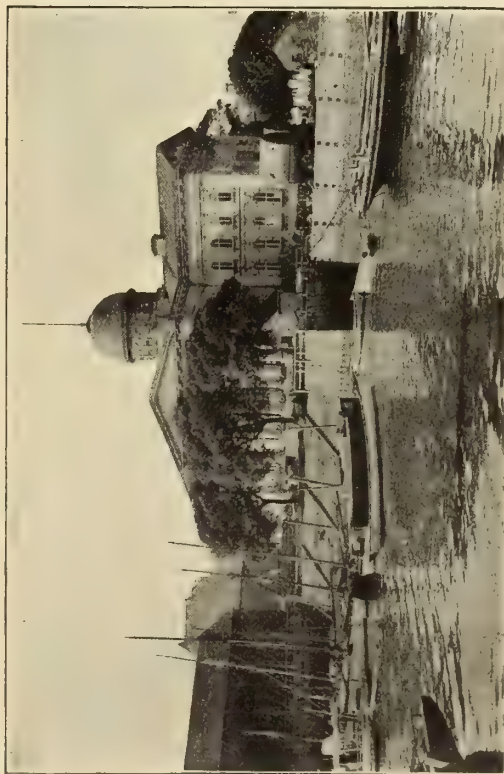
# VIEWS IN HISTORIC QUEBEC



Grand Allee and Parliament Buildings



Monument to those who fell under Generals Levis and Murray, in 1760



Custom House



The Kent House, Montmorency Falls



the dignity of a Basilica by Pope Pius IX. ten years later, was not entirely completed until 1889. It is a fine specimen of Corinthian architecture, and is of immense proportions.

The Redemptionist Fathers, who are in charge of the Basilica, declare that miracles are daily being performed there, paralytics being made to walk, the blind to recover their sight, and the infirm being restored to health. There are pyramids composed of hundreds of crutches, canes, trusses and splints left by people as testimony of the efficacy of the saint's intervention on their behalf. Votive offerings left by grateful people are numerous, and include a great variety of jewellery, among which are two yards of rings strung close together on rods.

Close by the Basilica is a building called the "Sancta Scala," built in imitation of the steps of Pilate's Palace at Jerusalem, "up which our Saviour mounted during his sacred passion." Each step contains relics of the Holy Land. Zealous suppliants may often be seen there climbing the steps on their knees, and kissing each step before mounting it.

In the city proper and facing the historic old market square, which dates back to 1686, where in olden times stood the public pillory, is the Basilica, the mother church of Roman Catholicism in North America. Its



Laval University, Quebec.

erection was commenced in 1647, and finished in 1657. The design of the chancel is in faithful imitation of that of St. Peter's of Rome. On its walls hangs a rich collection of paintings, many of them priceless works of art, which were rescued from destruction during the Reign of Terror in France, when the mob pillaged churches and monasteries.

Conspicuous among the great public buildings of the city is the Seminary of Quebec, founded in 1663 by Laval, the first appointed prelate of Canada. The buildings are valued at \$10,000,000. The institution includes the Grand and Petit Seminaries, the latter being especially interesting to Americans from the fact that the officers under Montgomery and Arnold who were captured during the siege of 1775, were incarcerated in it. The Grand Seminary, known as Laval University, is the chief French-Canadian university, and the oldest in Canada. Laval has an excellent museum and library, and many art treasures are in its keeping.

The local convention committee have worked indefatigably and have made admirable arrangements for the entertainment of the Association's members and friends. Under their direction nothing of interest will be missed by the visitor. After the first day's work is completed the delegates will be afforded an opportunity of seeing Quebec by electric cars. This trip is made at night, when the city assumes its most charming garb.

On the second day Laval University will welcome visitors, wearing the insignia of the C.E.A., between 3.30 and 5.30 p.m. On this day also an opportunity will be afforded of visiting the Chaudiere Falls, under the guidance of the officials of the Canadian Electric Light Company, whose development is at this point. In the evening the members will be entertained to dinner at the



Steamer Rapids King Shooting the Rapids in the St. Lawrence River.

Kent House, Montmorency Falls, and a visit will afterwards be paid to Quebec's old-fashioned Rustic Theatre. Perhaps the most interesting event on the entertainment committee's list is reserved for the final day, when a trip by steamer will be made around the harbor of Quebec, including a visit to the now famous bridge site. In the evening Dufferin Terrace will be the scene of a band concert.

Those who have the local arrangements in charge are: Messrs. E. A. Evans (chairman), L. Burran, W. Langford and A. P. Doddridge, of the Quebec Railway, Light



Steamer Kingston of the R. & O. Fleet.

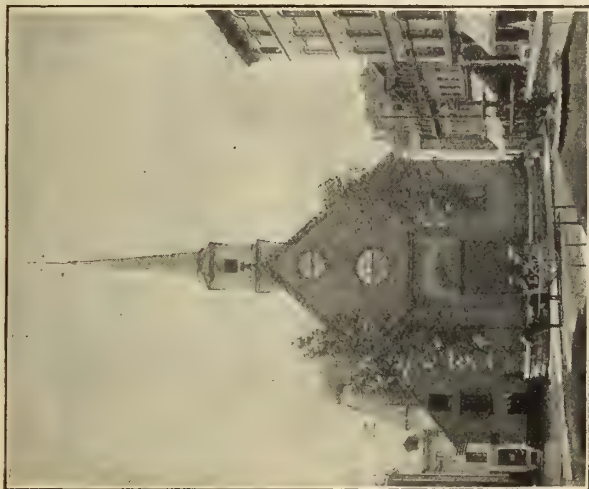
& Power Company; J. E. Tanguay, J. M. McCarthy and L. J. Denis, of the Quebec Jacques-Cartier Electric Company; J. Dorais, and D. S. Barton, of the Canadian Electric Light Company, and A. K. McCarthy, of the Levis County Railway Company. All through the convention special arrangements will be made for entertainment of the ladies. The papers committee is composed of Messrs. A. A. Dion (chairman), R. G. Black, R. S. Kelsch, W. H. Eisenbeis and A. L. Mudge.



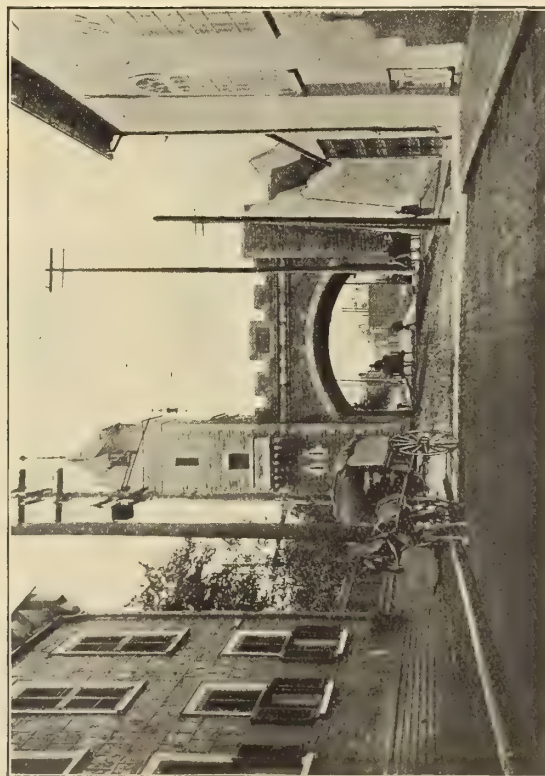
# VIEWS IN HISTORIC QUEBEC



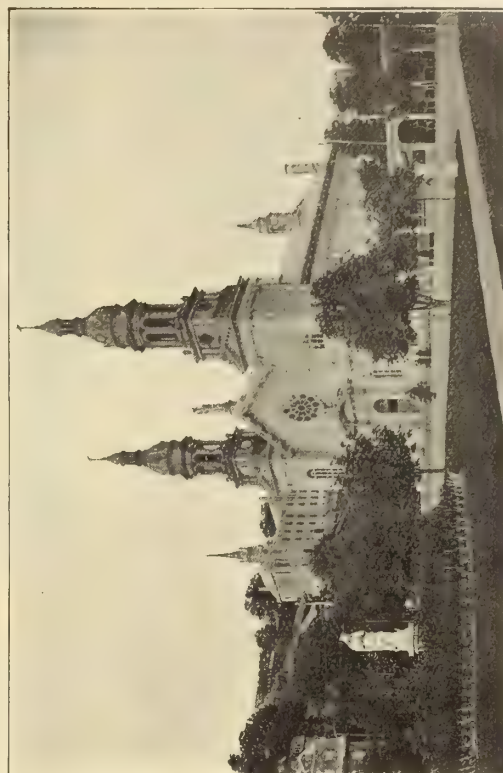
View of the Old City Walls.



Church of Notre-Dame-des-Victoires.



Kent Gate and Part of City Walls.



Church of St. Anne de Beaupre.





ARTHUR P. DODDRIDGE.



EDWARD A. EVANS, Chairman.



JOHN DORVAS.

## The Local Committee, C.E.A. Convention

We understand that no stone has been left unturned by the local committee to make pleasant and instructive the visit of their brother electricians to Quebec. Unfortunately, the chairman, Mr. Edward A. Evans, general manager of the Quebec Railway, Light & Power Company, has been unwell for the past few days, and his active presence has been missed by the committee, but it is hoped that he will be fully recovered before the convention. The members of the committee are practically all associated with the three light and power companies. Mr. Arthur P. Doddridge is superintendent of the Quebec Railway, Light & Power Company; Mr. Lewis Burran is

chief electrician, while Mr. Wm. Langford is also connected with this company. Mr. Donald S. Barton is general manager and chief engineer of the Canadian Electric Light Company. Mr. John Dorais is also connected with this company, as general superintendent. Mr. J. M. McCarthy is the president of the Quebec-Jacques Cartier Electric Company; Mr. Leo J. Denis is the chief engineer and electrician for this company, while Mr. J. E. Tanguay, another member of the committee, is the assistant secretary of the same firm. Mr. A. K. McCarthy is connected with the Levis County Railway Company.



WM. LANGFORD.



J. EUGENE TANGUAY.



LEWIS BURRAN.

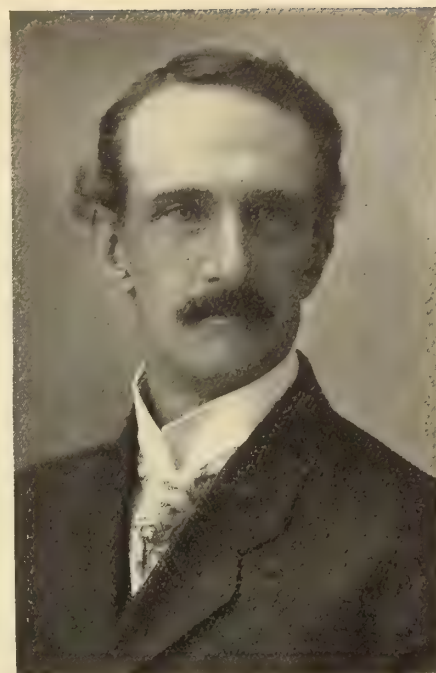




A. K. MCCARTHY.



LEO. DENIS.



D. S. BARTON.

## PROGRAM CANADIAN ELECTRICAL ASSOCIATION CONVENTION

### FIRST DAY—WEDNESDAY, JUNE 16th.

- 10.30 a.m.—Opening Session.  
 President's Address.  
 Secretary-Treasurer's Report.  
 Reports and Communications.  
 11.30 a.m.—"Synchronous Motors for Correction of Power Factor," B. T. McCormick, Montreal.

### AFTERNOON SESSION.

- 2.00 p.m.—"Power Rates for Central Stations," L. W. Pratt, Hamilton.  
 "Notes on the Operation of Small Central Stations," R. Smith, Perth.  
 "Accounting for Electrical Companies," R. F. Pack, Toronto.

### EVENING.

- 8.00 p.m.—Seeing Quebec by electric cars.

### SECOND DAY—THURSDAY, JUNE 17th.

- 10.00 a.m.—"The Conservation of Our Natural Resources through the use of High Efficiency Lamps," S. C. Doane, Cleveland.

### SECOND DAY — Continued.

#### EVENING.

- "Electrolytic Lightning Arresters," Prof. L. A. Herdt and J. Dale-Mont, Montreal.  
 "Questions, Answers, and Topical Discussion of Business Getting," E. J. Phillip, Berlin; H. O. Fisk, Peterboro, and E. A. Evans, Quebec.

### AFTERNOON SESSION.

- 2.00 p.m.—"Considerations Affecting the Choice of Type in Transformers," G. Percy Cole, Montreal.  
 Questions, Answers and Topical Discussion on the use of Transformers for General Distribution, J. W. Purcell, Walkerville, Ont.; P. S. Coate, Chatham, Ont., and I. H. Wright, Nor... Bay, Ont.  
 3.30 p.m.—Executive Session.  
 4.00 to 5.00 p.m.—Laval University to be open to members wearing badges. Members also to have opportunity of visiting Chaudiere Falls.

- 8.00 p.m.—Dinner at Kent House, Montmorency Falls, Rustic Theatre afterwards.

### THIRD DAY—FRIDAY, JUNE 18th.

- 10.00 a.m.—"Gas Engines and Plants," Wm. P. Flint, Westinghouse Machine Company, Pittsburgh, Pa.  
 "Insurers and Insured; Illusions and Delusions," E. P. Heaton, Manager Insurance Department, Canadian Manufacturers' Association, Toronto.  
 Discussion—Rules of the Railway Commission of Canada Governing Wires Crossing Railways.  
 Unfinished Business.

### AFTERNOON.

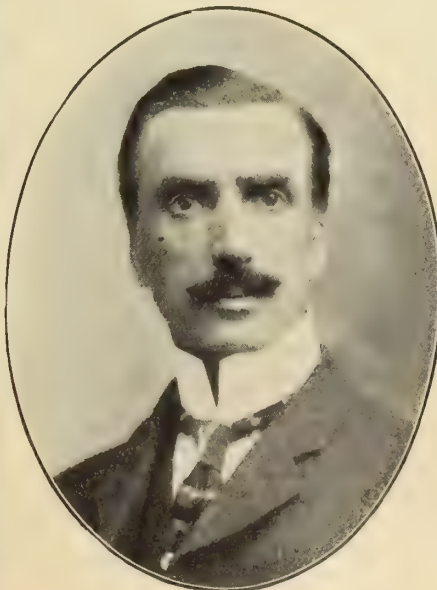
- 2.30 p.m.—Trip by steamer around the harbor of Quebec, including the bridge site.

### EVENING.

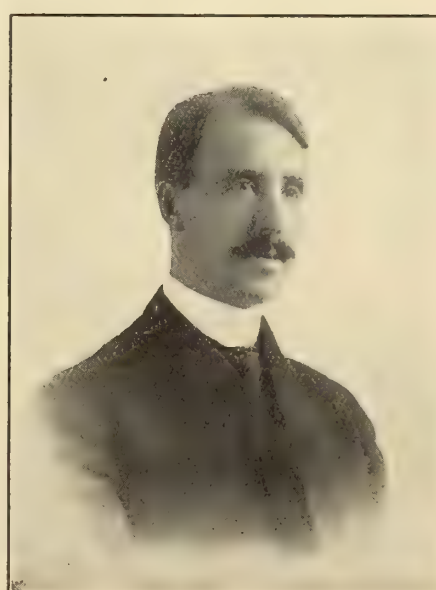
- 8.00 p.m.—Band Concert on Dufferin Terrace.



W. N. RYERSON, President C. E. A.



A. A. DION, Chairman Papers Committee.



W. A. BUCKE, Chairman Finance Committee.



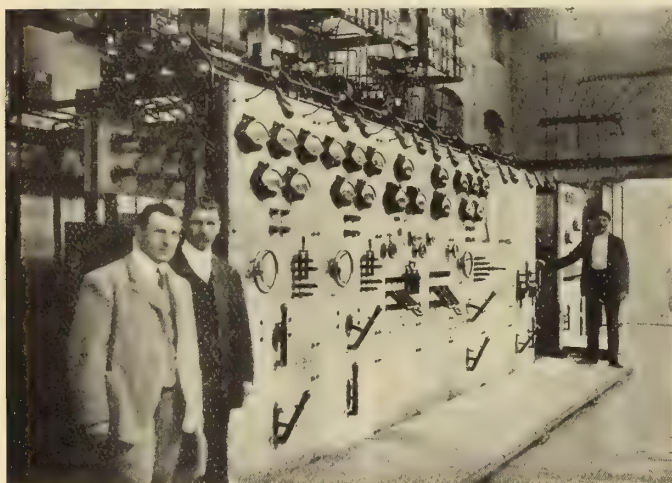
# Water Power Development in and About Quebec

## A Description of the Three Large Power Concerns Furnishing Light and Power to Quebec City

### Canadian Electric Light Company

The Canadian Electric Light Company was formed and granted charter rights in the Province of Quebec early in 1898. Their efforts were directed to the Chaudiere Falls some six miles from Levis, opposite Quebec, where it was estimated 6,000 h.p. was available. Messrs. T. Pringle & Sons, hydraulic engineers, of Montreal, supervised the construction work, preliminary operations commencing in the fall of 1898.

Above the falls the development consists of a main dam of concrete masonry, extending across the river for 826 feet, being connected to the east shore by a heavy concrete abutment with walls six feet thick, carried well into the clay bank, filled in behind with earth and clay.



Switchboard—Canadian Electric Light Company.

The western end of the main dam terminates in two heavy sluiceway piers, the sluiceway itself being 12 feet wide. A wing dam joins these piers to the bulkhead, extending down stream a distance of 150 feet, forming the eastern boundary of a head race. The bulkhead, parallel to the main dam, and at right angles to the wing dam, is 28 feet high, and is constructed of concrete masonry. The head gates in front of the penstock openings are of special design, being built of 8-inch I beams, spaced 12 inches apart, rivetted to  $\frac{3}{8}$ -inch plate, completely covering the whole area of the gate. The gates are constructed in two parts, the upper section, about 27 inches, being lifted first, leaving an opening 12 inches wide, permitting water to enter and fill the penstock, balancing the pressure on both sides, when the lower and largest section can be more easily raised. The hoisting mechanism, operated by hand, consists of a double purchase winch geared to a vertical steel stem four inches in diameter, having a double screw of square thread mounted between two rows of  $\frac{3}{4}$ -inch steel bells. The reservoir impounded by these head works contains over 70,000,000 gallons of water, and extends up stream about one mile.

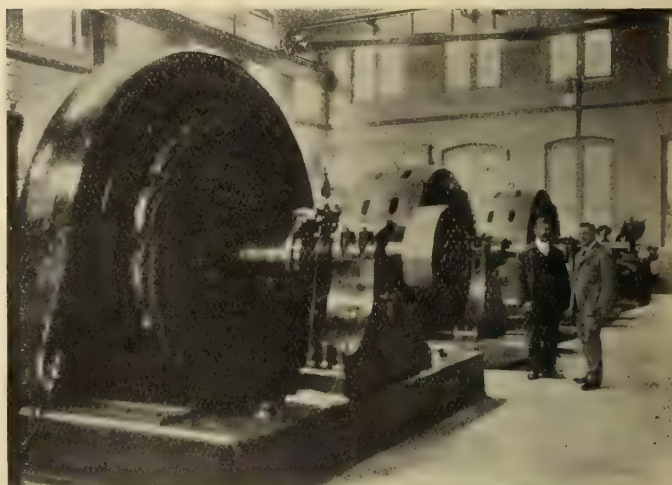
### Penstocks

Trouble from frazile and anchor ice has not been experienced at this development, partly due to the location of three small islands at the west side of the pond

and in front of the head race, deflecting the main current of the river towards the east shore, carrying the frazile over the eastern part of the main dam. Provision has been made at the bulkhead for three penstocks, 8 feet 3 inches in diameter. The first, 160 feet from the bulkhead, is nearly horizontal, there being a slight drop. It then descends the hill at an angle of about 40 degrees for a distance of 140 feet, and then horizontally for a distance of about 60 feet, where it enters the power house by two elbows. The bends over the brow of the hill and to the horizontal at the foot are of a radius of about 40 feet, reducing the friction to a minimum and allowing ample room for expansion and contraction, there being no expansion joints. The courses are five feet wide, the thickness for the first 160 feet being 5-16 plate, the remaining 200 feet are of  $\frac{3}{8}$  plate. Plates are lapped at  $3\frac{1}{2}$  inches, double rivetted throughout, the 5-16 plate by  $\frac{5}{8}$  rivets spaced 3 and  $1\frac{1}{2}$  inches between rows of rivets, and  $\frac{3}{8}$  plates by  $\frac{3}{4}$ -inch rivets,  $3\frac{1}{2}$  on centres and  $1\frac{3}{4}$  between rows. Saddles are provided for supporting the penstock, spaced 15 feet horizontally, consisting of 6 x 4 angles with 5-inch channels braced diagonally, the angle iron being bent to fit the circumference of the penstock.

### The Power House

The power house measures 52 x 82 feet outside, the foundations being set in heavy rubble masonry, laid in cement mortar, with concrete foundations for machinery and cement floor. The walls are of brick, the roof consisting of two layers of  $1\frac{1}{2}$ -inch pine, laid diagonally



Power House—Canadian Electric Light Company.

on 8 x 12 southern pine purlins supported on steel trusses spaced 16 on centres. These trusses are set on latticed girders, which also support the runway for a 15-ton travelling crane. The east side of the roof is provided with a large skylight. The whole building is well lighted by two rows of windows, and is fireproof throughout, with the exception of the roofing.

The three units installed consist of three McCormick turbines, built by the S. Morgan Smith Company, of York, Pa., having two 33-inch wheels, set with end inlet and central discharge, the buckets being of cast steel with heavy cast iron guide chutes. The dome lids



are provided with adjustable water bearings and lignum vitæ steps. Each pair of wheels is mounted in a wheel case 9 feet in diameter, having a heavy cast iron head rivetted and braced to the case. The main body of the case is of  $\frac{5}{8}$  medium steel, having a tensile strength of 65,000 pounds.

Each pair of wheels is attached to steel shafts 21 feet long, 9 feet  $6\frac{1}{2}$  inches of which is 6 15-16 inches in diameter, the remainder being 5 15-16 inches; to which is keyed the runners, which have a normal speed of 400 r.p.m. Rigid couplings are provided between turbine and generator, keyed to the shafts and forced on by hydraulic pressure. Cylinder gates controlling the water, which are opened by rods passing through the lid of the wheel case, are arranged with C. I. racks and steel pinions to receive the gate gearing of Lombard governors and provided with counter-weights for balancing.

Draft tubes 29 feet long, 5 feet 6 inches in diameter at upper end and 6 feet 6 inches at lower end, extending into the wheel pit, provide exit for the water. These wheels were rated at 1,400 h.p., but have exceeded this guarantee under 112 feet working head, and have an efficiency of over 73 per cent. under full load.

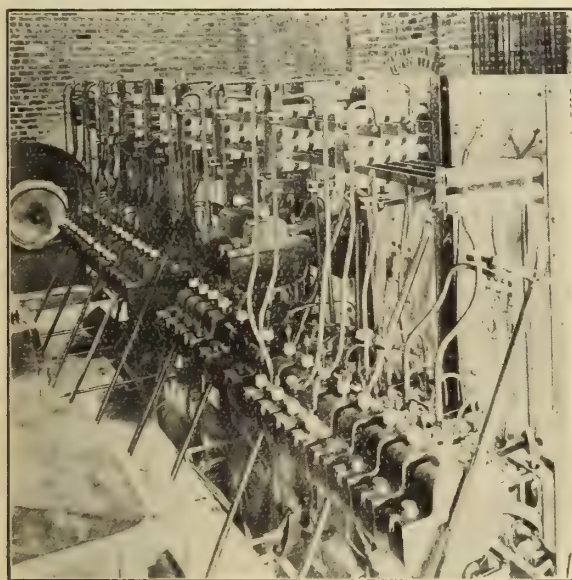
The speed regulation is controlled by Lombard type "B" governors of the oil pressure class, having the pressure pumps on concrete floor stands on the opposite side of the shafts from the governors. As an auxiliary to these governors, and largely aiding them in close regulation under this head, two balanced relief valves are placed at the foot of the penstock, just before it is connected to the wheel cases. These valves have 15-inch pistons in a cylinder, one end of which is connected to the penstock directly. The opposite end is connected to a 4-inch pipe inside the penstock, extending up towards the bulkhead for 160 feet. When working nor-

These valves are built by the Lombard Governor Company, of Boston. This governor has operated very successfully since installation, having taken care of the machines when the full load has been suddenly taken off the generators. The generators have been operated in parallel with both governors on, or with one governor on and one machine operated by the hand, the governor adjusting gate opening to suit fluctuations in load.

Three generators are installed, of the three-phase revolving field type, two built by the Canadian General



Laying Cable—Canadian Electric Light Company.



Rear View, Switchboard—Canadian Electric Light Company.

mally, this "static head" pipe takes the piston in equilibrium, the pressure on both sides being balanced. Any ram in the penstock due to a sudden closing of the gates, increasing the pressure on the end of the cylinder directly connected to the penstock, opens the valve, which remains open until the pressure has been equalized. The sensitiveness of this arrangement is controlled by check valves having spiral springs, the tension of which can be adjusted to open the relief valve under one pound per square inch increase of pressure.

Electric Company, rated at 750 k.w., and one by the Allis-Chalmers-Bullock Company, rated at 1,000 k.w. These machines are rated at 750 k.w. on non-inductive load at a normal potential of 10,500 volts, with a frequency of 66 $\frac{2}{3}$  cycles, and a speed of 400 revolutions per minute, capable of delivering 25 per cent. overload for four hours and 50 per cent. overload for one hour without excessive heating. The cast iron armature frame is of a strong box section, into which are dovetailed the iron punchings of the core, the windings being set in slots held in place by wedges driven over them. Ventilating spaces between the armature luminations provide for ample circulation of air. The cast steel revolving field, weighing 13,000 pounds, has 20 projecting poles dove-tailed into the steel spider. The total weight of each generator is about 35,000 pounds each.

Three exciter units, two of 30 k.w. and one 60 k.w. machine, are installed, each one capable of supplying full load excitation current for both main generators. These machines, of the General Electric, moderate speed, multipolar type, are direct connected to 50 h.p. McCormick turbines, having 12-inch bronze runners. Mechanical governors regulate the speed to suit all conditions of load.

The switchboard contains seven panels of blue Vermont marble, with all instruments of marine black finish. Each generator has a separate panel, the exciter instruments and synchronizing lamps on a third, with two line switch and three phase electrostatic ground detector on the fourth. Triple pole oil switches, of the General Electric Company's type "K," control the current from the generators to the 10,000-volt bus-bars, and from the bus-bars to the transmission lines. These



switches are capable of breaking in oil, 100 amperes at 15,000 volts

Thomson inclined coil instruments are used on this board, one ammeter per phase on each generator panel, with a voltmeter and field current ammeter. The field current is controlled through a rheostat, giving a range of 10 per cent. above normal and 20 per cent. below normal working voltage. From the generators to the switchboard a three conductor, lead covered cable, insulated to withstand 25,000 volts, is run in tile ducts carrying the high voltage current. Single conductor cable connects the line switches to the two transmission lines outside the building, passing through the brick wall in 4-inch tile elbows filled with insulating compound, and having bells connected to the lead casing, preventing any injurious effect from static discharges.

Protection from lightning is through Wirts lightning arresters of the G. E. pattern, and G. E. multiplex



Reeled Cable on Lighter—Canadian Electric Light Company.

type, connected to each phase just before it passes through the brick wall of the power house.

#### Transmission Line

The main transmission line, extending from Chaudiere Falls to Levis—a distance of nine miles—consists of 35-foot cedar poles, about 100 feet apart, having two 4-pin cross arms bolted to the pole. With this arrangement of two cross arms and pole cap, provision is made for carrying three circuits triangulated 18 inches apart. Three lines of No. 4 medium drawn copper are strung, one line on triple petticoat porcelain insulators of the Imperial type, and the other on triple petticoat glass insulators.

Crossing the Chaudiere below the power house is made No. 1 hard drawn copper, supported on either side by towers made of four poles forming the corners of a square, having 5 x 6 double cross arms with three insulators to each wire, the wire being tied around the arm on the centre groove of the insulator. The poles are given a good rake in shore and heavily guyed with strain insulators and turnbuckles inserted. The wires

are 30 inches apart, the span being 420 feet, each transmission line having a separate tower on either side. Eight feet below the transmission lines are strung two galvanized iron No. 12 telephone wires on side blocks, connecting the power house and sub-station. This line is also used for signalling between sub-station and power house for voltage regulation by cutting out the telephone and using current of low voltage with signal lamps on the switchboard.

#### The Levis Substation

The Levis sub-station is situated near the outskirts of the town of Levis, on the heights overlooking the St. Lawrence directly opposite the city of Quebec, and in it are located the step-down transformers and distributing switchboard of the company. The building is of brick, 22 x 42, with concrete floor and transformer foundations, with a wooded roof covered with galvanized iron, and is equipped with a two-ton travelling crane.

The two transmission lines enter the south side of the building to oil switches supported on the wall, twelve feet from the ground, connecting each line to a set of 10,000-volt bus-bars  $\frac{3}{4}$  x 3-16 bare copper, the bars, in turn, being connected to four banks of step-down transformers through similar oil switches.

Three banks of step-down transformers, consisting of six 200- k.w. air blast Wagner type, connected in pairs with three-phase primary and two-phase secondary, switchboard from different points on the secondary having regulating dials on the secondary, allow a range of voltage between 2,080 and 2,690. The dial switches are connected to the front of the board by chains and sprocket wheels, allowing of separate phase regulation, or of regulating both phases simultaneously. These transformers, being of the shell type, each coil is wound and spaced so as to give large cooling surface, and interlaced so as to reduce magnetic leakage to a minimum, maintaining excellent regulation on load of any power factor.

There are also installed two 150 Westinghouse oil-cooled step-down transformers, Scott connected, three-phase and two-phase, with the same ratio of transformation as the Wagner type, but not equipped with regulating dials. These transformers may all be worked in parallel, giving a maximum output of 2,000 k.w.

The switchboard consists of nine panels, one being for each bank of transformers, equipped with ammeters for each phase, voltmeter, and four-pole double throw circuit breaking oil switches made by the General Incandescent Arc Lighting Company, of New York. These transformers feed into two sets of bus-bars known as Quebec and Levis, from which circuits are led off to a distributing system in the towns of Levis, St. Joseph and St. Romauld, and two circuits to the submarine cable of the company, through which they are now supplying the Q.R.L. & P. Company with 1,000 electrical horse-power for use on their incandescent distributing system and motor circuits.

Two panels control the Levis distribution, equipped with ammeters on each phase, and single throw circuit breaking oil switches. A panel is also provided for separate control of the incandescent street lighting circuits. These circuits are operated in multiple, having separate transformers, one leg of the primary being connected to the circuit breaking oil switch, the other leg being in common between the street lighting transformers and the house transformers.

The officers of the company are Donald S. Barton, General manager and chief engineer; John Dorais, general superintendent; T. Demers, power house superintendent; E. Trudel, treasurer; Georges Belleau, secretary.

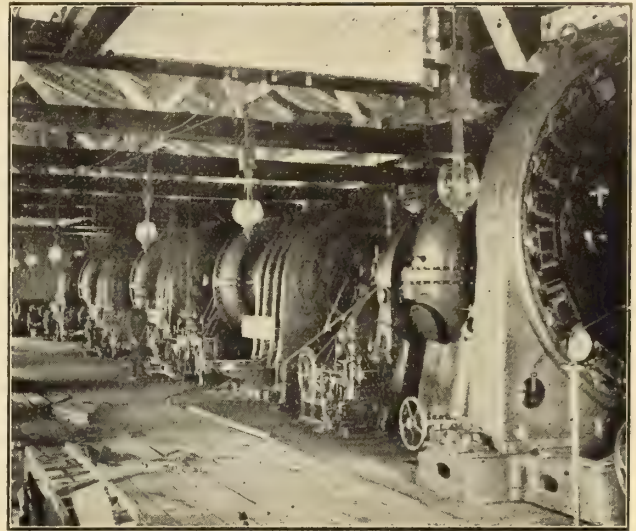


## Quebec Railway, Light and Power Company

Quebec is noted for its picturesque falls, but perhaps the grandest of all are those on the Montmorency river. This is due to the fact that the water is dissembled at the brink and falls in one mass of white, foaming spray, 267 feet to the rock bottom beneath. These falls are only seven miles distant from the city of Quebec and as one would expect to find, they have been used since an early date for industrial purposes. The first instance of power being obtained from the falls was 100 years ago, when a large sawmill was operated by hydraulic power. This in turn gave away to the Quebec & Levis Electric Light Company, who built a dam close to the falls, and by means of a wooden flume supplied water to its power house situated under the bluff near the river. The Montmorency Electric Power Company, Limited, then came into existence, absorbed the old company, and started a radical change. This company was later taken over by the Quebec Railway, Light & Power Company, who carried out the changes contemplated by their predecessor. A unique method of obtaining power is adopted by a cotton mills company who are established at the foot of the falls, and obtain

current at that point to cause it to enter. This has been a very successful method of dealing with the frazil and the company have had practically no trouble from this source.

The intake pipe is of tank steel, 2,609 feet long. Provision for the protection of the pipes from the changes



Generators—Quebec Railway, Light and Power Company.



25,000 Volt Switches and Transformers—Quebec Railway, Light and Power Company.

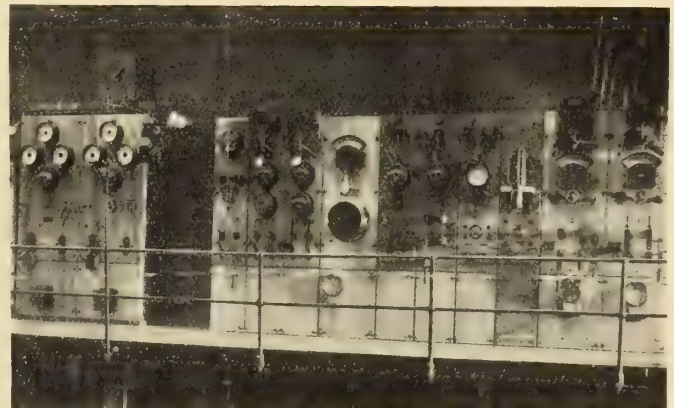
water power to the extent of 1,000 h.p. and electricity to the extent of 600 h.p., by utilizing the remaining potential energy of the discharge water from the present power house, which is situated some distance above the mills.

### Hydraulic Development

An immense concrete dam has been built by the present company 300 feet long, 100 feet from the brink of the falls. At the left hand of the dam is the gate house, a concrete building, from the upper corner of which is a wing dam extending up stream 325 feet, enclosing on its shore side the head race, a body of calm, clear water. This wing dam is built of cribwork varying from eight feet wide at the top to twenty feet at the bottom. Along the river bottom of this wing dam are seven apertures, varying from 12 to 20 feet in width, all being seven feet high. By this means floating rubbish is prevented from entering the head race, Frazil or needle-like ice crystals which form only in rapid flowing water, and are always a bugbear to Canadian water power development, is taken care of as follows: The swift current of the river sweeps all the frazil down stream over the dam, none passing through the apertures in the cribwork on account of there not being sufficient

in volume of water flowing due to the opening and closing of the turbine gates as the load on the generators changes, and also to allow the generators to regulate the changes of load on the generators only, was obtained by the use of stand pipes instead of relief valves. It is believed that this plan has had much to do with the successful engineering of this important installation.

The power house is a stone structure of two stories, 47 feet wide by 150 feet long. The turbines are the Victor high pressure wheel, and were built by the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio. There are five units in the plant, each having a capacity of 1,000 h.p. under a head of water 200 feet high. The wheel shaft is coupled direct to the generator shaft with flange couplings. For regulating the variation of speed



Switchboard—Quebec Railway, Light and Power Company.

of wheels and generators due to change of load, there is attached to each turbine a Giesler mechanical-electrical governor. At the official test made by the engineers appointed by the Quebec Railway, Light & Power Company, the turbine at half gate gave an undisputed efficiency of 78 per cent.

There are three-600 k.w. and one-720 k.w., two-phase



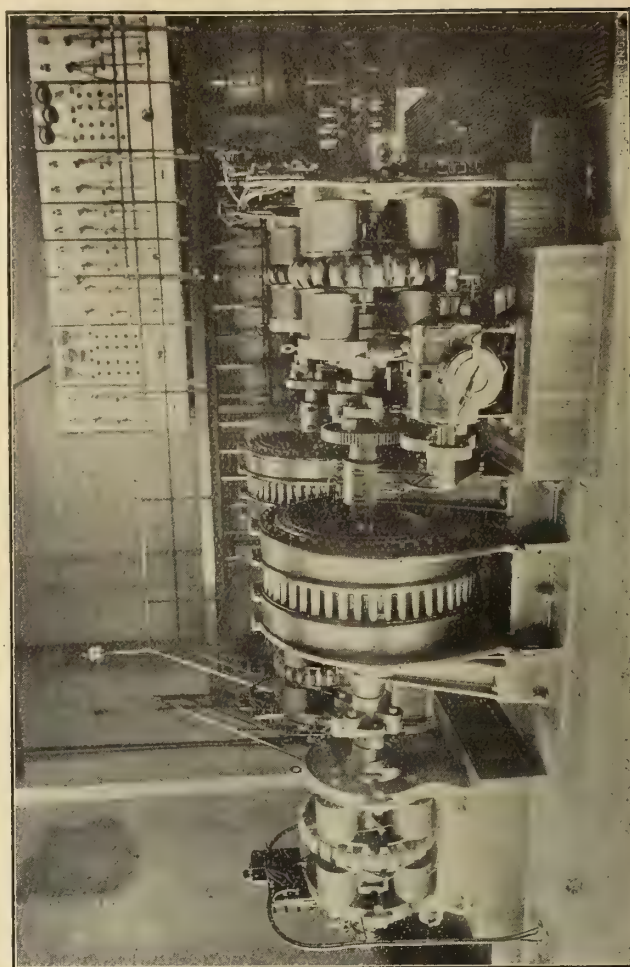
S.K.C. alternators delivering current at a frequency of 66 cycles per second at a pressure of about 5,500 volts, and the current is transformed to 23,000 volts, and three-phase by Scott-connected Westinghouse transformers. The fifth unit is a Westinghouse generator delivering direct current at 550 volts from one end, and two-phase alternating current from the other end. The D.C. current is used on the St. Anne's Railway, which passes the power house, and the alternating current is transformed from 385 volts two-phase to 11,000 volts three-phase, and transmitted to a sub-station at Ste. Anne de Beaupre, where it is transformed from 11,000 volts three-phase to 385 volts two-phase, and by means of a Westinghouse 200 k.w. rotary converted to 550 volts D.C. on to the trolley of the Ste. Anne's Railway. There are two D.C. generators separately driven for excitation purposes. The switchboard is of blue Vermont marble panels, built by the Westinghouse Company. On this switchboard are situated all the instruments and rheostats for regulating the machines, and the mechanism for operating the oil switches, which are placed in concrete compartments away from the switchboard. In an adjacent building is placed four-1,000 k.w. Westinghouse transformers. Another power house located about a mile up the Montmorency river has: An Allis-Chalmers-Bullock 2,200 h.p. wheel and 1,500 k.w. generator, which delivers current to the Falls power house and is banked on the bus bars there. A fine concrete dam over 60 feet high was built across the Montmorency river near this power house, which gives, in addition to the power, a water storage of 54 million cubic feet. There are two pole lines to Quebec about seven miles long, three wires on each line, of No. 0 B. & S. bare copper, which follow the line of railway to near the city limits, then cross the St. Charles river by means of two steel towers

### The Sub-Station

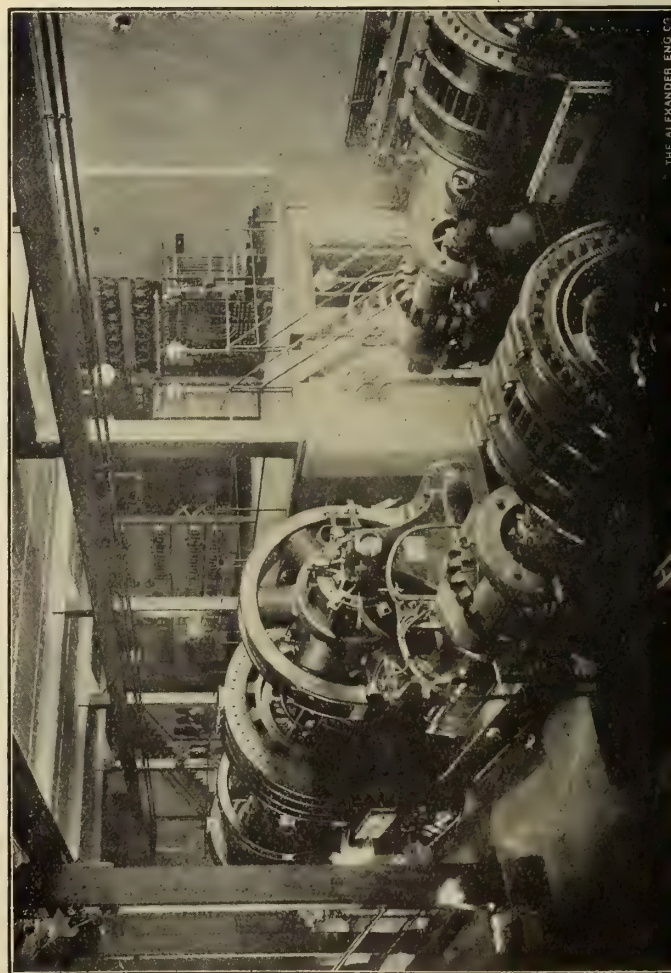
Situated on Queen street in Quebec is the sub-station. Here are six-1,000 k.w. Westinghouse transformers three-phase two-phase 23,000 to 2,300 volts, located in a fireproof annex, in which are also the lightning arresters and the 23,000-volt remote control switches. There are two motor generators of 550 k.w. capacity and a storage battery for the railway service, and motor-generators for the arc lamp service. Power is also supplied to this sub-station by the Canadian Electric Light Company from their power house at Chaudiere 12 miles away, being brought by cable under the St. Lawrence river opposite the city. The lines enter the transformer building through glass panels, to disconnecting switches at the entrance, where Wirtz low equivalent lightning arresters are placed on a gallery, thence to Westinghouse remote control oil break switches, to Westinghouse transformers 23,000 volts primary, 2,300 secondary, Scott-connected three-phase to two-phase.

The switchboard on main gallery controls all the commercial lighting and power circuits, as well as the feeders to the synchronous motor switchboard located on the opposite gallery. Here may be seen a modern switchboard, each panel of which controls a synchronous motor and an induction starting motor, panels being 32 inches wide, and adjacent thereto an old-time switchboard whose five panels, of a total width of eleven feet, formerly controlled the same synchronous and starting motors. On the same gallery is a 550-volt direct current switchboard controlling the generators, boosters, storage battery and feeders of the railway.

There is now being installed a 1,000 k.w. motor-generator set for railway purposes, and a 45 k.w. motor generator for exciting the synchronous motors, both of the Crocker Wheeler make. A 20-ton hand crane runs



Arc Machines in Sub-Station—Quebec Railway, Light and Power Company.



Railway Generators in Sub-Station—Quebec Railway, Light and Power Company.



the length of the station. The machine leads are rubber covered, placed in ducts in the floor covered with iron plates. There are 18 miles of street railway track on the city system, which, owing to the narrow streets, have some very sharp curves, many of 35-foot radius, and some heavy grades, one being 16.4 per cent. The snow problem is a hard one in Quebec, 156½ inches fell during the past winter, nevertheless the car service was never stopped.

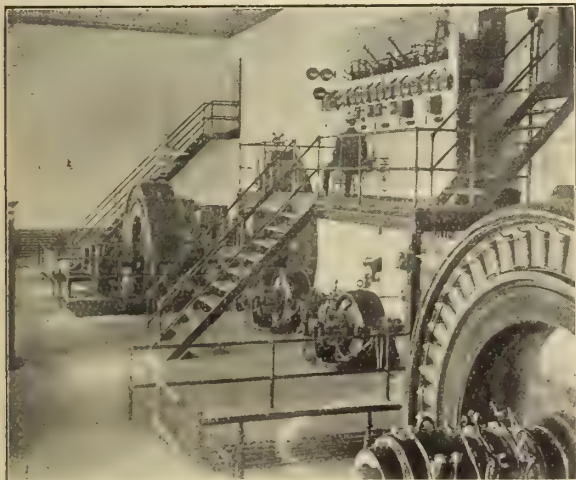
Besides the street railway the same company operate a 30-mile road that passes the Montmorency Falls and the shrine of Ste. Anne de Beaupre, famous for the many miracles worked there, and where 200,000 pilgrims journeyed last year. The electric cars on this road have a speed of 45 miles per hour, are equipped with four 75 h.p. Westinghouse motors and air brakes.

At Montmorency there is, electrically operated, an elevator taking passengers up the side of the cliff, landing them close to the Kent House, at one time the residence of the King's grandfather, now a first-class hotel and pleasure resort and owned by the same company. Here may be seen in Holt, Renfrew & Company's Zoological Garden polar and black bears, seals, beavers, buffalo, moose, deer, foxes, wolves and many other animals; also a very large variety of birds, etc.

Mr. E. A. Evans is general manager and chief engineer of the company, under whose supervision most of the various works have been brought to their present efficiency.

## The Quebec-Jacques Cartier Electric Company

The Quebec-Jacques Cartier Electric Company will possess many features of interest to the C. E. A. visitor who will find time to visit their plant and works. In March, 1909, this company entered on the ninth year of its existence, and its progress since inception has been very marked. The power house is situated on the



Dynamo Room—Quebec-Jacques Cartier Electric Company

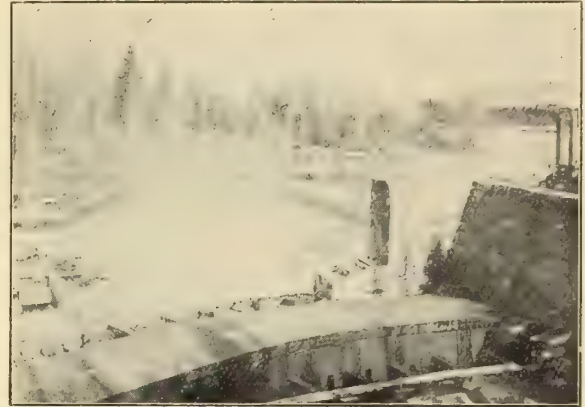
Jacques Cartier river about twenty miles from the central portion of Quebec City, and water at 33 feet head is led to it through two 14-foot penstocks each 200 feet long.

### The Power House

The inside of the power house is divided into three main divisions, the dynamo room occupying half of the whole building; the lower portion of the other half contains the dynamo and exciter wheels. Above these are the living quarters of the working staff and the step-up transformers. In the dynamo room there are two West-

inghouse units running at 150 r.p.m, able to carry a maximum load of 1,500 h.p., direct connected to 54-inch McCormick water wheels, and two exciters, each having enough capacity to excite both generators. These two small units are also direct connected to 18-inch turbines.

The switchboard consists of five panels, one exciter panel, two generator panels and two line panels, wired up in the standard Westinghouse fashion. Two Lombard generators were installed, fearing-hammer effect in the



View of Dam—Quebec-Jacques Cartier Electric Company.

penstocks in case of a sudden shut-down. Standpipes were erected, at the power house end, to each penstock. There are two sets of oil cooled step-up transformers, raising the voltage from 2,200 to 22,000 volts; each set is three-phase delta connected.

The system of signalling from distributing switchboard for obtaining proper regulation is most convenient and up-to-date. It consists of instruments ingeniously placed at each end of the telephone line, but without interfering with it in the least, and by means of which telegraphic signals may be sent. This is found to be much more convenient than the use of telephone for close regulation.

### The Transmission Line

The transmission may be divided into two parts, one being the transmission line proper, consisting of two three-phase 22,000 volt lines, 18 miles in length and extending from the power house to the step-down transformer house, which is located just outside the city limits. The wires on these lines are No. 4 hard drawn bare copper, strung 18 inches apart to form an equilateral triangle (with apex on top) on each side of the pole.

To overcome different obstacles and according to territory over which the line has to pass, various size poles had to be used; these range from 35 to 75 feet. These two lines are protected at both ends with sets of Wurts lightning arresters arranged in the standard Westinghouse fashion. In the step-down transformer house, besides the lightning arresters just referred to, are two sets of Scott connected oil-cooled transformers, converting current at 22,000 volt three-phase.

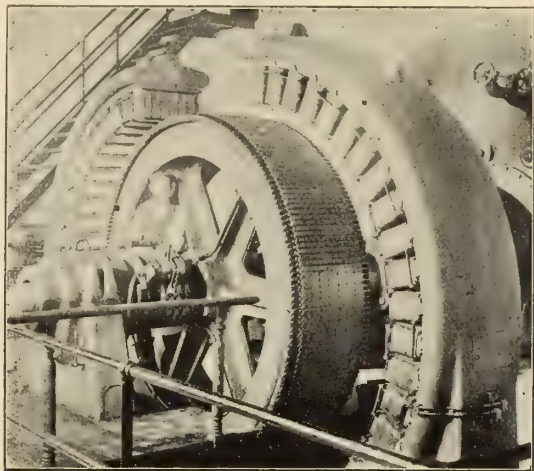
The second part of the transmission, two miles in length, consists of two two-phase 2,200 volt lines of two No. 2-0 wire, strung on two separate pole lines, and extends from the step-down transformer house to the central portion of the city, where the distributing switchboard is located. These two pole lines, although starting and terminating at the same points, follow a perfectly different route through the city.

### The Distribution Switchboard

The distributing switchboard consists of twelve panels of blue Vermont marble mounted on iron frame



about one foot from the floor. There are three incoming line panels, two now in operation and one spare, two regulator panels and five feeder panels. Besides these there is a panel for the power circuit and one blank. In circuit with the in-coming lines are indicating wattmeters, ammeters, and recording voltmeters. The feeder panels include ammeters, recording wattmeters

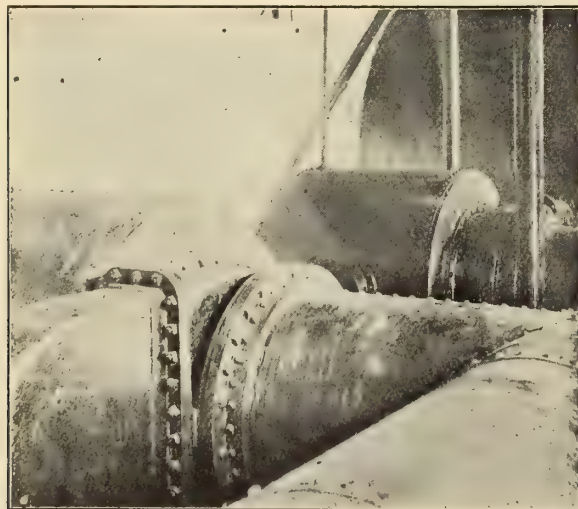


Generator—Quebec-Jacques Cartier Electric Company

and a system of plugging by means of which any circuit may be put onto either phase of any line. I. T. E. single pole circuit breakers are placed on each feeder circuit on separate mountings over each panel. On the two regular panels are placed the regulators, one for each feeder. Then connected with two 350-range voltmeters, one mounted on each regulator panel, are the pressure cables which carry the pressures back to the systems.

#### City Distribution

The city is divided into several districts fed by separate single phase primary feeders (as may be noted



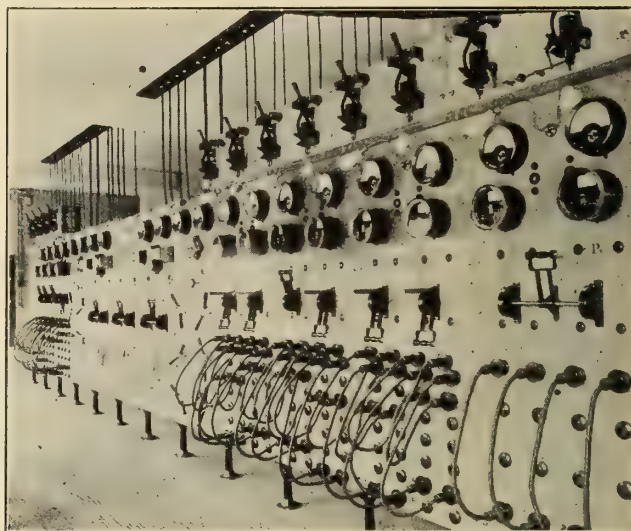
Wheel Room—Quebec Jacques Cartier Electric Company

from the description of the switchboard the power distribution is quite separate from the lighting). In each of these districts is a main bank of transformers connected to feed a three-wire secondary system (108 volts on each side). On these banks the standard of transformer used is 15 k.w., although banks or distributions with smaller sized transformers exist when convenient.

In the secondary distribution the three-wire system is very much adhered to, being even used for service wires strung on house brackets, from which several customers are fed. The outlying districts are fed from independent transformers, most of them on the two-wire system.

The company have spacious up-town quarters where the whole of the ground floor is devoted to general offices, the appointments of which are rich and imposing. The distributing switchboard is on the floor above the office, and also on this floor is a complete laboratory for testing apparatus and for purposes of experiment. The engineer's offices are partitioned off from the switchboard room by means of a glass partition, so that the engineer and his assistants have a full view of the operating room. Immediately above the switchboard floor is the distributing tower, composed of slate slabs, and on both sides of same are the store rooms. In the basement are the stock and inspectors' departments, and on account of the lay of the land the back entrance opens onto the street in the rear.

The company has the contract for city lighting and to carry this section of the load they have two main



Distributing Switchboard—Quebec-Jacques Cartier Electric Company

units of 200 h.p. each, General Electric induction motors, 2,200 volt type. On each side of these there is a direct connected 6.6 ampere brush, d.c. arc dynamo. A third unit is comprised of a 100 h.p. one arc dynamo. The switchboard controlling this apparatus consists of eight panels, one for each of the motors and five for arc machines and circuits.

In addition to the above equipment a steam auxiliary plant of 1,800 h.p. capacity has been built in the neighborhood of the step-down transformer house. Three units of equal capacity have been installed, each consisting of a cross-compound, condensing, Robb-Armstrong engine belted to a 2,200-volt revolving field Bullock generator. The 2,200-volt transmission lines are controlled from the switchboard in the auxiliary plant. The arrangement of this switchboard is such that by a system of plugs either line may be fed from either set of step-down transformers or from the auxiliary plant itself. Mr. Emerson McMillin, of New York, is the chairman of the board of directors. J. M. McCarthy, of Quebec, is president and general manager of this company. Mr. Leo Denis, is their electrical engineer. Mr. J. E. Tanguay is the secretary. At the steam generating stations Mr. J. Hamilton is in charge, and Mr. Anthony Meagher is superintendent of the hydraulic plant



# Practical Treatise on Tungsten and Carbon Lamps

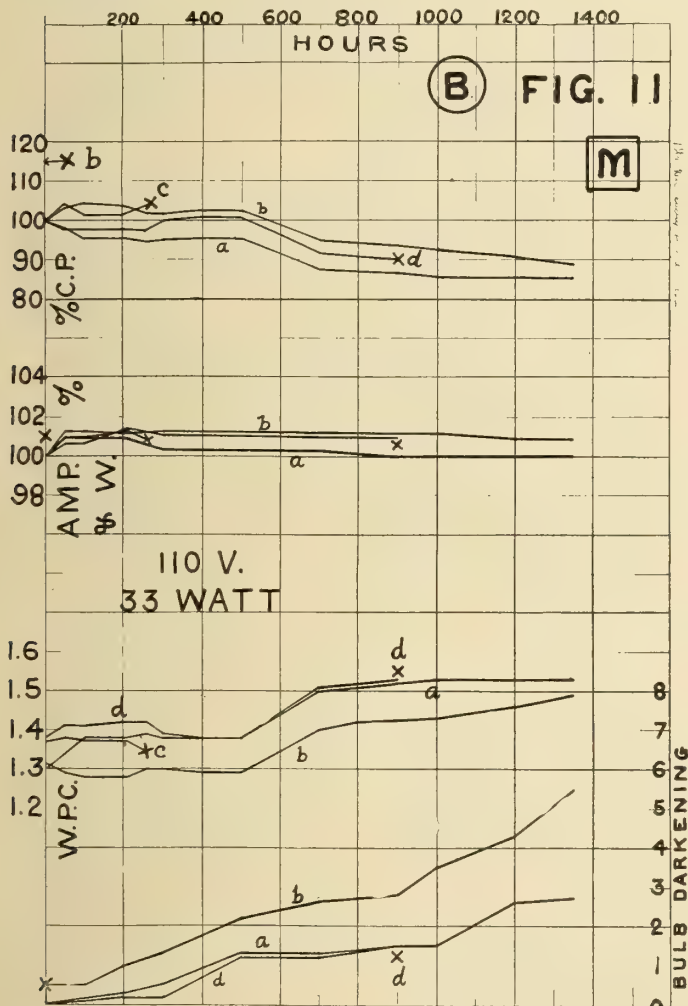
Showing by Charts the Results of a Series of Life Tests.  
Consideration of the Future of Metallic Filament Lamps\*

By H. D. Burnett

Figures 3 and 4 (May issue) show the results of two lots of carbon lamps made at the same time in exactly the same way, from the same lot of filaments, and having the same initial efficiency. One lot ran on circuit [M] and the other on circuit [S]. The useful life of lamps on circuit [S] averages 865 hours, or 78.6 per cent., of the useful life of lamps on circuit [M] (1,100 hours). The change in direction of the c.p. and w.p.c. curves after 700 hours (Fig. 4) due to the higher average voltage on the circuit, is noticeable but not very marked. This doubtless is due to the fact that the lamps have by this time become practically 4 w.p.c. lamps and are, therefore, not so much affected by fluctuating voltage as lamps of higher efficiency would be, or as these lamps would have been had they been subjected to this excessive

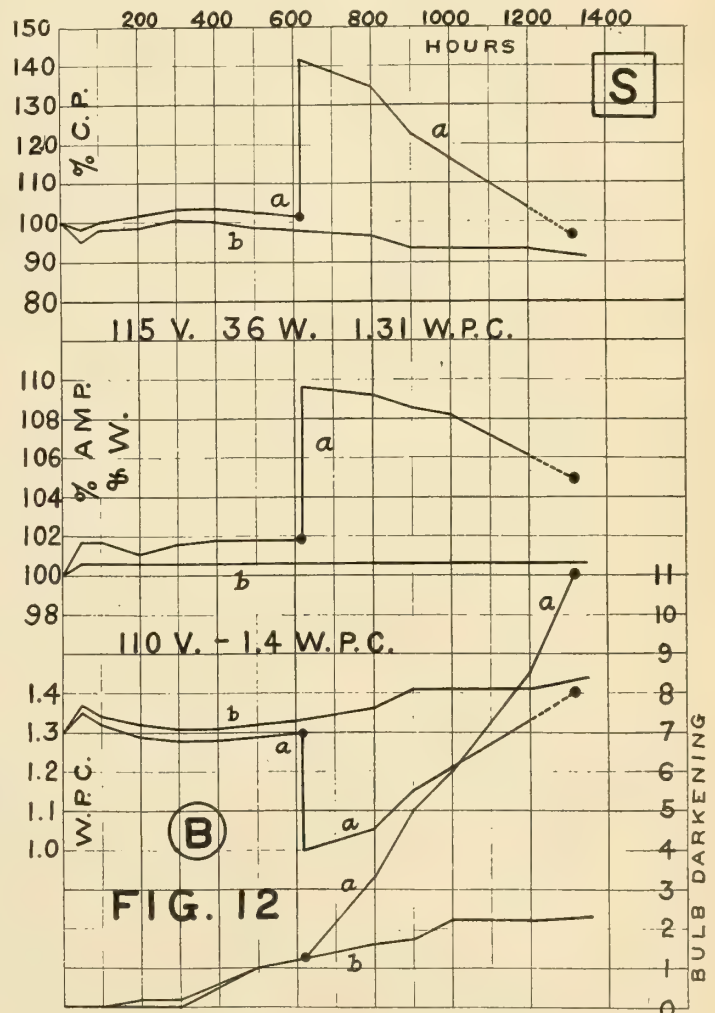
efficiency its life is only 24 per cent. as long as at 3.5 w.p.c. The spread in the ampere curves is noticeably more pronounced in Fig. 4 than in Fig. 3.

By comparing Figs. 13 and 14, consisting of same class and same make, the c.p. curves in Fig. 13, excepting C, are quite level up to 500 hours, whereas those in Fig. 14 start to drop at 100 hours, and maintain about the same rate of decline up to 800 hours, when the rate of decline increases noticeably, due to the rise in average voltage. (See Fig. 10.) The efficiency and ampere curves in the two figures (13 and 14) do not differ widely, but the bulb darkening is much greater in Fig. 14, especially for lamps a, b, d. The exceptional lamp c, in Fig. 14, does not become noticeably dark up to 700 hours, and at 1,350 hours is still giving 90 per



voltage at the start. The fact that new lamps, when subjected to excessive voltage burn out quickly, while old lamps on the same circuit are apparently unaffected, is often taken as convincing evidence that the new lamps are defective, but this by no means follows.

It is seen by the curves that the 3.5 watt lamp after burning approximately 800 hours consumes 4 watts per candle, and 8 per cent. increase in voltage at that time changes the efficiency to 3.1 w.p.c., at which efficiency a new lamp will, on good regulation, last 500 hours or more. Whereas, the 3.5 w.p.c. lamp when subjected to 8 per cent. increase in voltage has its efficiency changed to 2.66 w.p.c., at which



cent. of its initial c.p., notwithstanding the marked fluctuations in voltage and the high average voltage during the last 600 hours. This is a remarkable performance on a circuit such as [S]. Figs. 11 and 12 show a comparison between circuits [M] and [S] for the same class of lamps in another make. There were only two lamps in Fig. 12, and one of them is still giving 91 per cent. of its initial c.p. at 1,350 hours. This lamp, together with lamp c in Fig. 14, show what is possible for good lamps on a circuit of variable voltage. A further comparison between circuits [M] and [S] is afforded by Figs. 19 and 20 for lamps of the same class and make, all operated with bowl-shaped holophane clear glass shades. For this comparison it is proper to consider only lamps a, b in Fig. 19 and b, d in Fig. 20. Since the other lamps in these figures are apparently defective, omit-

\* For the first section of this paper, see May ELECTRICAL NEWS.

ting the apparently defective lamps, the differences between these two figures are not very marked. These figures will be referred to later on, under the question of shades.

#### How Frosting Affects Lamps.

The effect on life of frosting lamps is clearly shown for carbon lamps in Fig. 6, in which the full lines represent clear lamps, and the dotted lines lamps entirely frosted by the acid dipping process. All the lamps in these two lots were made at the same time, in the same way, from the same lot of filaments and, before frosting, all measured the same efficiency. The difference shown in the figure for initial efficiency is due entirely to the frosting of one of the lots, which lot started with 13 lamps, a sample being taken out after each 100 hours, to serve as a standard for darkening of bulbs in frosted lamps. The difference in c.p. and efficiency is marked from the very outset and it will be observed that the curves separate more widely as the life progresses. The average useful life of the frosted lamps is 715 hours, which is 63 per cent. of the useful life of the clear lamps. You will observe that the ampere curves practically coincide for the two lots, the slight differences being due to the abstraction a sample frosted lamp every 100 hours and to the burning out of one clear lamp at 718 hours and the breakage of another at 801 hours.

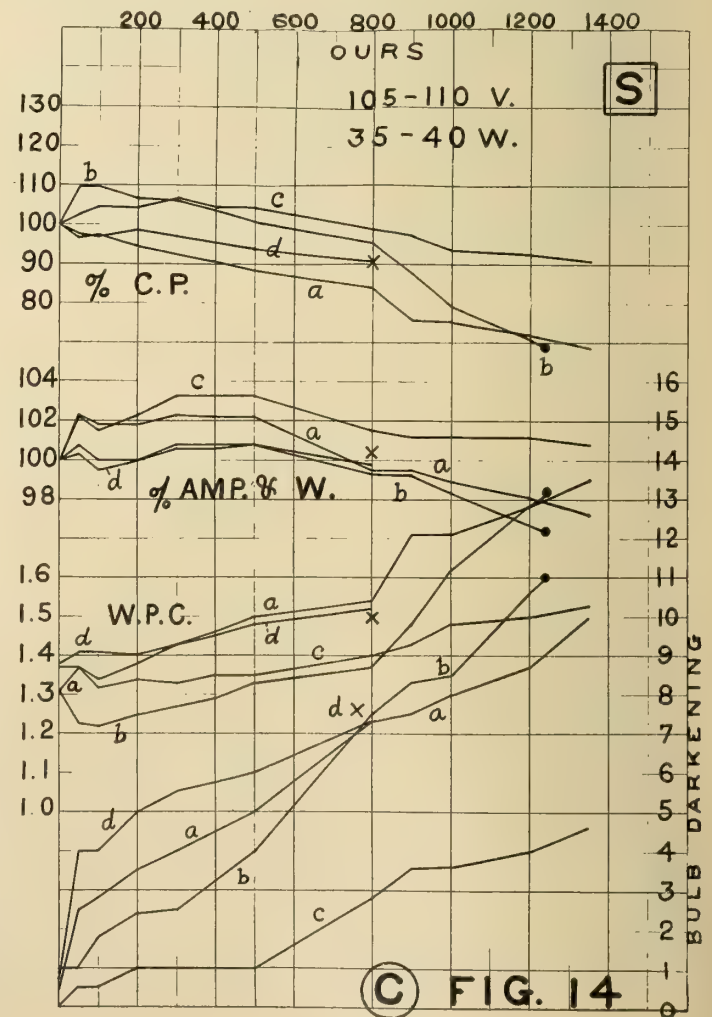
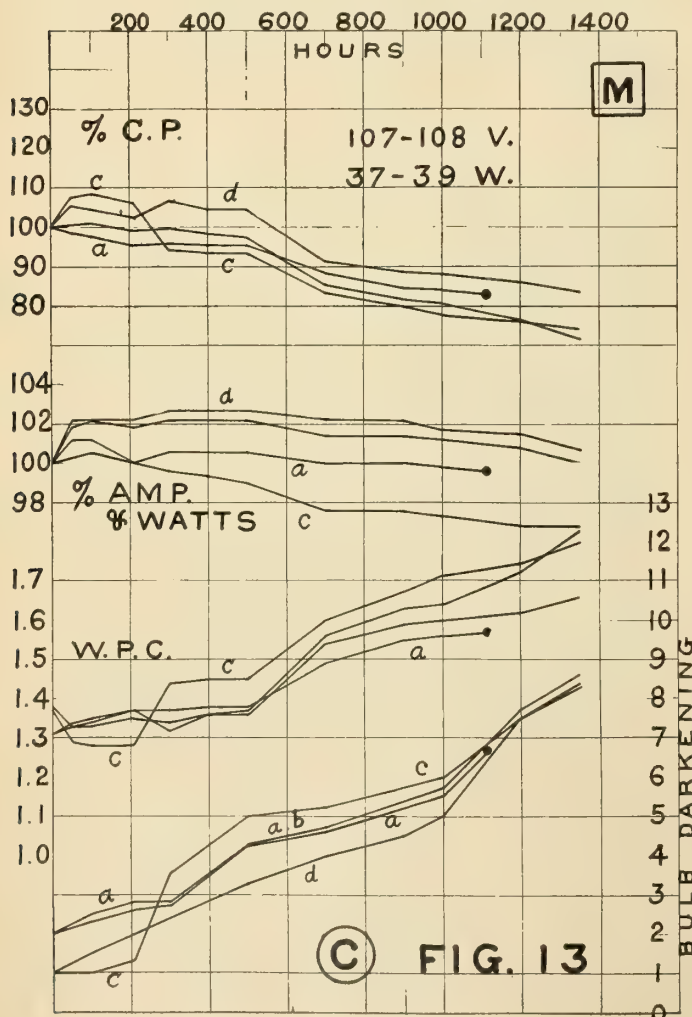
As the darkening of the bulb in the frosted lamps cannot be compared with that of the clear lamps by the method that has been used, the bulb darkening is here shown only for the clear lamps. All of the tungsten lamps in all the charts are "bowl" frosted excepting those marked "clear." This was done for two reasons: first, in order to secure a comparison under like conditions for the different makes, all of the lamps of one make that were available being bowl frosted. Secondly, it is considered desirable to shield the eyes from the direct glare of the tungsten filament, and with the ordinary bowl-shaped shades that are generally used with tungsten lamps the lower portion of the lamp is usually exposed to view and should be frosted. The percentage of total bulb surface that is frosted varies from 45 to 50 per cent.. If the frosting of the entire bulb reduces the useful life of carbon

lamps by 37 per cent., it is reasonable to assume that the useful life of tungsten lamps would be similarly reduced by frosting the entire bulb, and that by frosting one-half of the bulb the useful life would be reduced about 18 per cent. This should be borne in mind in making comparisons between the various charts and in considering the life curves. Notwithstanding this disability several lamps have passed the 1,200-hour point and have not yet declined to 90 per cent. of their initial c.p. Examples, Fig. 11-b, Fig. 12-b, Fig. 14-c.

A comparison between bowl frosted and clear lamps of the same make and class, on the same circuit, is afforded by Fig. 16, in which the bowl frosted lamps are represented by dotted lines. Two of the three lamps were broken by accident between 200 and 300 hours, leaving but one lamp for comparison with the three clear glass lamps, which are represented by full lines. The frosted lamp had about 47 per cent. of its bulb frosted. You will observe that during the first 500 hours, its c.p. curve runs about parallel and between the clear lamp curves, but its rate of decline after that is a little greater than for the clear lamps, and at 1,000 hours it has declined 83½ per cent. of its initial c.p. Whereas, the average c.p. for the three clear lamps at 1,000 hours is 89½ per cent. of their initial c.p. Please note that the clear lamps all started at an efficiency of 1.25 w.p.c., while the bowl-frosted lamp started at 1.32 w.p.c. Had they all been started at the same efficiency there doubtless would have been a more decided difference in their performance.

You will notice that although of poorer efficiency, the w.p.c. curve of the frosted lamps rises more rapidly than that of the clear lamps, and that the darkening of the frosted lamps (i.e. the clear part of the bulb) is somewhat greater at 1,000 hours. There is no marked difference in the ampere curves.

Fig. 17 also affords a comparison between another make of lamps, some bowl frosted and others clear. The short dotted lines, lamps m, n, are clear lamps, and the full lines, lamps a, b, d, are bowl frosted lamps of the same class as m and n. The two clear lamps burned out at 275 and 815 hours, but the c.p. curves are always well above those of the bowl-frosted lamps. At the last measurement, 700 hours,





clear lamp n gave 99½ per cent. of its initial c.p., while at the same point the average c.p. of the three bowl-frosted however, started at a little poorer efficiency (1.42 w.p.c.) lamps was 88 per cent. of their initial c.p. This clear lamp, than any of the frosted lamps, and thus had an advantage aside from the question of frosting. Lamp S in this figure is a high c.p. lamp of the same make, bowl-frosted, and with shade, and starting with a very poor efficiency (1.8 w.p.c. when measured clear, at 110 v.). This lamp was run on the [S] circuit, and on account of its widely different efficiency can hardly be compared with the other lamps.

#### Effect of Shades on Tungsten Lamps.

Figs. 18, 19 and 20 exhibit one make of tungsten lamps, all the lamps being of the same general class and received at the same time, and therefore presumably made at the same time. The lamps shown in Figs. 18 and 19 were run at the same time on [M] circuit, the four lamps in Fig. 18 without shades, and those in Fig. 19 with holophane clear glass shades of the "B" or "bowl" type, the lamps projecting about an inch below the bottom of the shades, and bowl-frosted same as those in Figs. 18 and 20. The lamps in Fig. 20 had similar shades, and were run on circuit [S]. The general appearance of Figs. 19 and 20 as compared with Fig. 18 tempt one to conclude that the use of such shades is injurious to the lamps, but this conclusion is not justified from a test of so few lamps, although all lamps in the three figures start at practically the same efficiency and therefore under similar circumstances, provided all were free from defects of manufacturer, might be expected to give similar performance on life test.

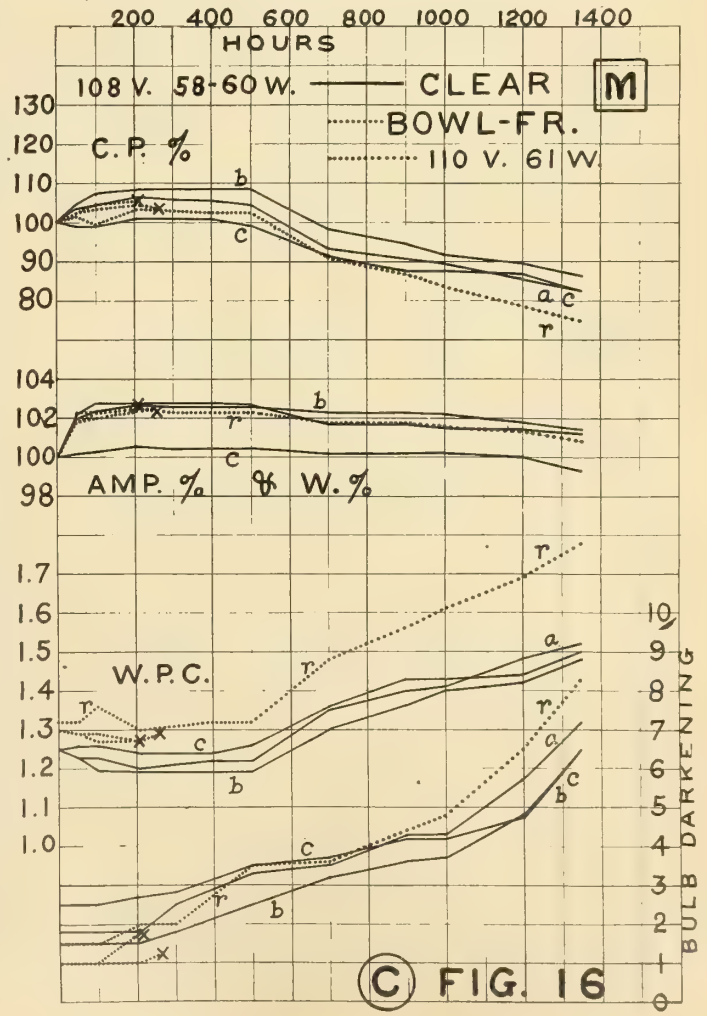
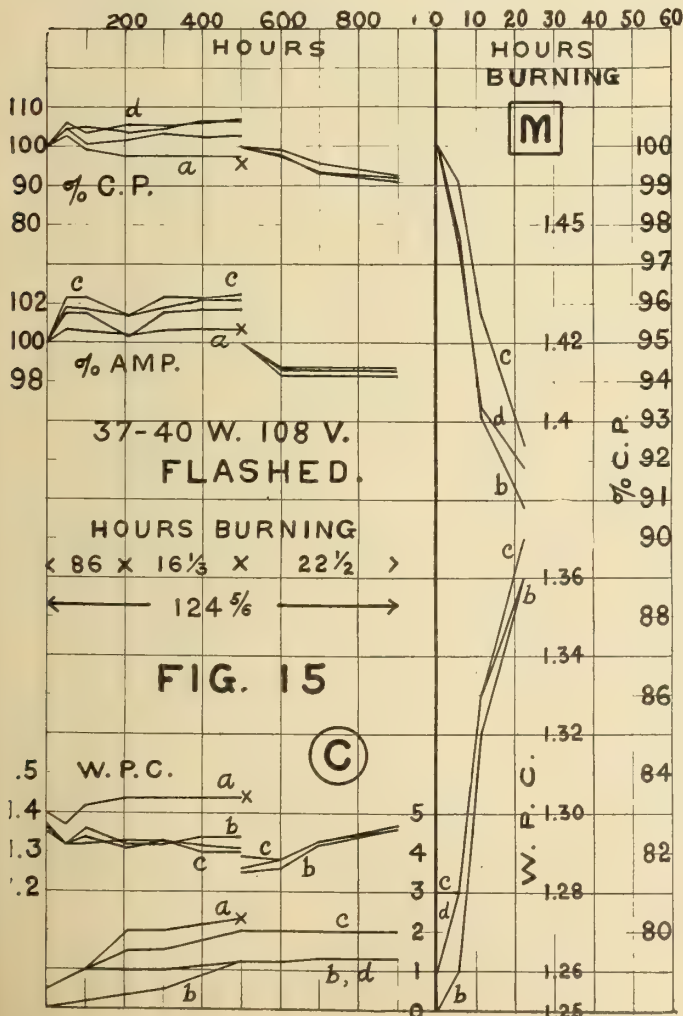
Note that one-half the lamps in Fig. 19 perform from the very start in such decidedly different manner from the other two lamps that it seems safe to conclude that the two lamps, C and D, were defective when they left the factory, especially since the phenomenal darkening of the bulbs starts so early in their life (at 300 hours) and is so very much greater than the darkening of lamps a and b. It should be observed, however, that these two peculiar lamps (c, d, Fig. 19) start out in almost exactly the same manner as respects c.p., w.p.c. and

current consumption, as lamps a, c and d in Fig. 18, which lamps, especially a and d, give good performance, retaining 80 per cent. of their initial c.p. after 1,200 hours' burning. With these two best lamps of Fig. 18 must be compared the two good lamps of Fig. 19, which average over 80 per cent. of their initial c.p. at 1,200 hours. Fig. 20 also shows two lamps, b and d, which give good performance when operating bowl-frosted with bowl holophane shades on the circuit [S] having very poor regulation of voltage, their c.p. being 80 per cent. of the initial after 1,200 hours' burning. The four lamps, a, b Fig. 19, and b, d Fig. 20, show conclusively that it is possible to make tungsten lamps that will give good performance when operated bowl-frosted and with such shades covering most of the lamps. This combination of bowl shade and bowl-frosted lamp is to be recommended as cutting off all direct rays from the intensely bright light of the tungsten filament, which rays, unintercepted, are without question injurious to the eyes when looked at directly.

Fig. 17 "S" is a 64 c.p. bowl-frosted lamp run with bowl holophane shade on circuit [S]. This lamp starts with the poor efficiency of 1.6 w.p.c., as compared with the other lamps, and therefore might be expected to give a better c.p. performance than the others. At 1,350 hours its c.p. is 82 per cent. of its initial c.p. Its w.p.c. curve up to 900 hours seems to rise at about the same rate as the more efficient lamps of the same make, but lower c.p. and without shades and run on circuit [M]. It has been observed that lamps operating with shades of the bowl shape, which nearly cover the lamps are noticeably hotter in the bulb than the same lamps burning without shades. It is possible that this tends to produce a more rapid deterioration in c.p. of the lamp when thus covered, some of the light, and also heat rays, being reflected back onto the lamp from the shade. It is reasonable to suppose that defects in the manufacture of tungsten lamps will be brought more conspicuously into light by the use of shades than if the lamps are used without shades.

#### Effect of Intermittent Flashing at Short Intervals on Tungsten Lamps.

It is known that the tungsten filament has a much lower resistance when cold than when lighted. Because of this the





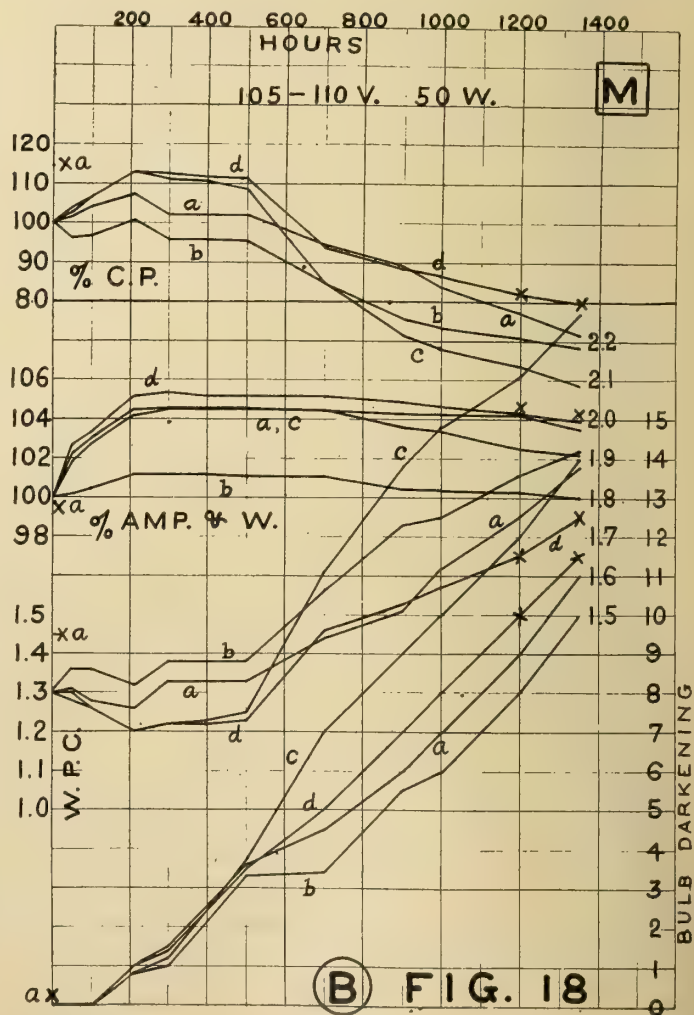
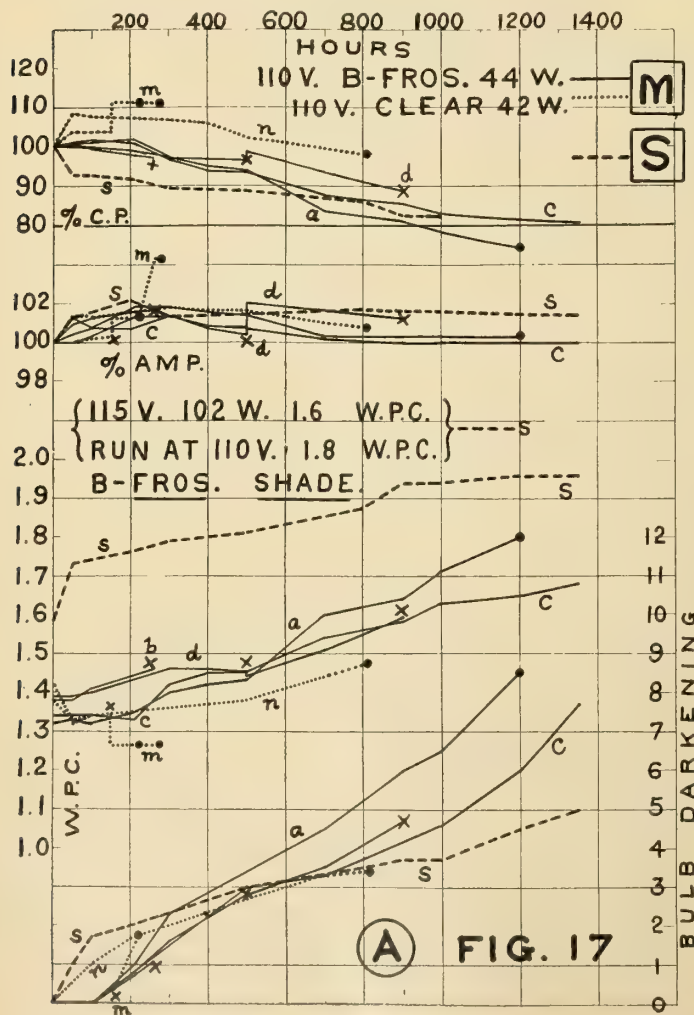
initial current passing through the filament for a fraction of a second when the lamp is lighted is about eight times as great as the final normal current of the lamp. This rush of current causes the candle power of the lamp for about one-eighth of a second to be considerably higher than the final normal c.p. of the lamp. In order to ascertain what effect this initial rush of current has on the life and behavior of the tungsten lamp, four lamps were started on circuit [M] at the same time as most of the other lamps. The lamps taken were from the same lot as those in Fig. 13 (same class and same make), so that comparison may be made with Fig. 13, the flashed lamps (Fig. 15) being run on the same circuit at the same time. Fig. 14 shows lamps from the same lot run on the [S] circuit. The lamps in the three Figs. (13, 14, 15) were all bowl-frosted and without shades. The left-hand portion of Fig. 15 is drawn to exactly the same scale as all the other charts, and the "Hours" at top of the sheet represent the time that the lamps were on circuit, but not the time they were actually burning. The length of time the lamps were actually burning is given in the middle of the chart.

During the first 200 hours on the circuit the lamps were flashed by use of "Skedoodle" sockets. These were found to be so unsatisfactory that a means was devised for opening and closing the circuit mechanically thereafter, so that the lamps were flashed 21 times every minute. At each flash they were lighted for about one-seventh of a second, so that they were burning, after the first 200 hours, only 5.63 per cent. of the total time. During the first 500 hours, you will observe that there is practically very little change in the lamps. It was thought that this might be due to the slight inductive resistance in the "Skedoodle" sockets, which was not altered when the mechanical flasher was introduced, but simply the contacts closed to prevent the opening of the circuit inside the socket. At 500 hours the "Skedoodle" sockets were abandoned and non-inductive resistance, in the shape of thick carbon rods from one-half to one inch long inserted in series with the lamps to bring them up to those voltages that were required initially to make them of the same efficiencies as the lamps in Fig. 13.

A noticeable change is apparent in the curves after the

500-hour point, but owing to the fact that from 500 hours to 900 hours the lamps were actually burning only  $22\frac{1}{2}$  hours, the total drop in c.p. being spread over 400 hours, does not appear pronounced. The right-hand portion of the chart, Fig. 15, shows the scale magnified ten times in both directions, and on this magnified scale is shown the actual percentage change in c.p., counting only the time that the lamps were actually burning. As the chart is simply enlarged without altering the relation between the ordinates and the abscissas, the rate of decline, or incline, in the curves of c.p. and w.p.c. may be directly compared with the corresponding curves in Fig. 13. As a matter of fact, the average rate of decline in c.p. per hour during the  $22\frac{1}{2}$  hours of actual burning for these three lamps, b, c, d, Fig. 15, was ten times as great as for the four lamps in Fig. 13, between the points of 500 and 900 hours. During the first 500 hours the lamps in Fig. 15 were lighted 521,066 times, and during the last 400 hours were lighted 504,000 times, making a total of 1,025,000 flashes for the lamps. The ampere curves and those for bulb darkening are not shown on the enlarged scale. The total change in the amperes, which is very pronounced, occurred during the first quarter of the 400 hours. The lamps seem to have settled down to a constant resistance in a short time, probably less than five hours of actual burning at the increased efficiency. No measurements were made between the 500 and 600-hour points. It is quite remarkable that this burning at higher efficiency did not increase the darkening of the bulbs, but it is quite consistent with the observed fact that when a well made tungsten lamp is quickly subjected to sufficiently high voltage to cause the filament to melt, this action does not cause any noticeable darkening of the bulb. In this respect the tungsten differs materially from the carbon filament.

Since the above was written the three lamps in Fig. 15 have run from 900 to 1,350 hours, during which interval the time of actual burning has been 25.3 hours, and the additional number of flashes have been 521,000, making a total of 1,592,000 flashes since the lamps started. After 900 hours there was a very conspicuous diminution in the rate of c.p. decline, due partly to the much lower efficiency at 500 hours (1.36 w.p.c.) as compared with the efficiency at 500 hours





(1.26 w.p.c.), but this change in efficiency does not appear sufficient to explain the fact that after 1,000 hours the candle power curves show no change in c.p. for two of the lamps, while the third lamp declined but one per cent. in c.p. The amperes remained the same from 900 up to 1,350 hours, while there was scarcely any noticeable increase in the darkening of the bulbs. I am unable to explain this change in behavior subsequent to the 900-hour point, and shall await with interest the result of similar experiments by other parties.

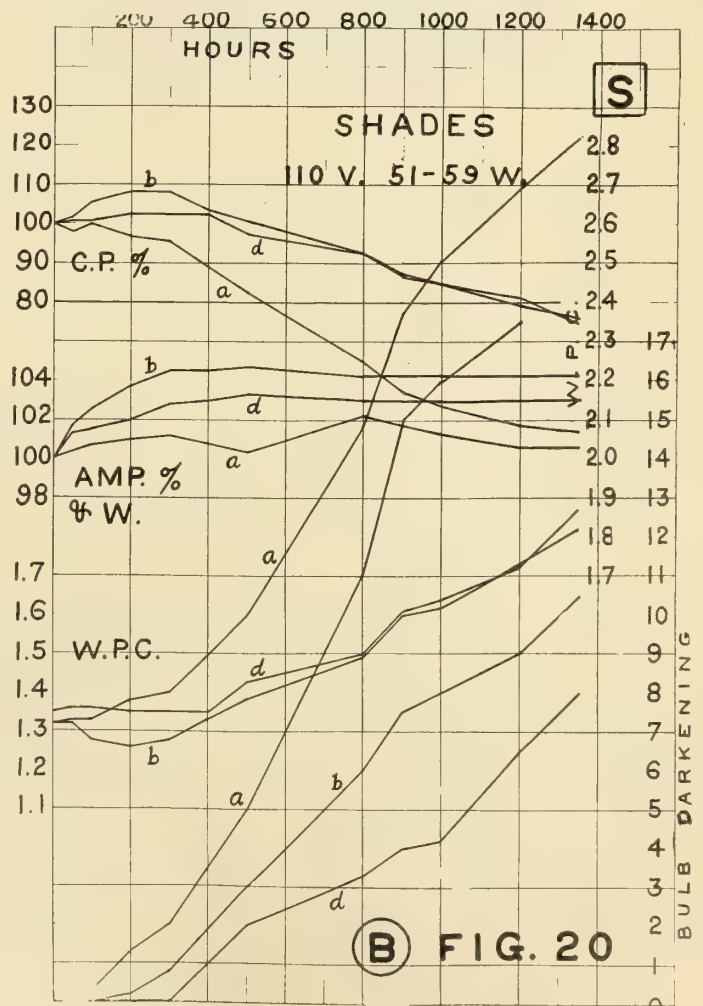
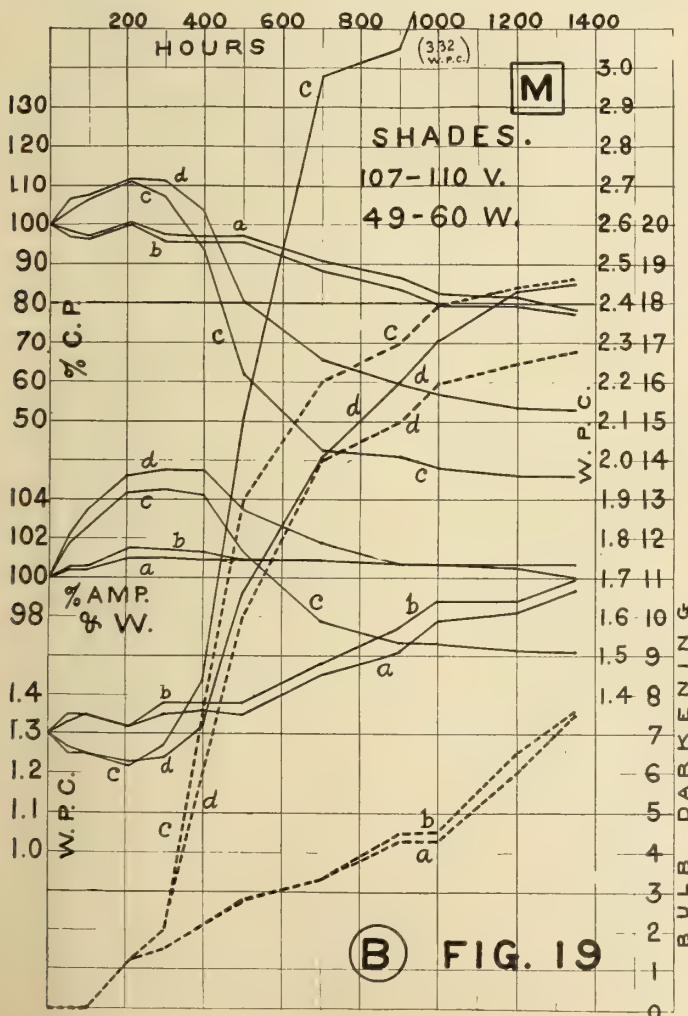
This feature of tungsten, as well as of other metallic filament high efficiency lamps is a valuable advantage which these lamps have over carbon lamps. A carbon filament once broken or burnt out is valueless in the hands of the customer, but a tungsten lamp with a filament broken or burnt out can usually be repaired by the customer, unless it happens to be that type which is in quite extensive use—having the anchors in the middle of the filaments. These latter lamps, holding the filaments quite rigidly in place, do not often permit of sufficient movement of the broken filament to enable one to complete the electric circuit inside the lamp.

The process of repairing consists simply of holding the lamp in such position, with the current switched off, that the broken filament bends and touches the next filament so as to complete the circuit, then turning on the current, the lamp lights up. If then the lamp is very carefully inserted into its permanent position and kept free from disturbance, it is likely to give long life, provided that in the process of repairing it has not been necessary to greatly reduce the total length of filament in circuit. If it is found impossible to complete the filament circuit with the current switched off, the switch may be turned on and a slight tapping of the lamp, when properly calculated, may cause the broken filament to vibrate and touch the next filament, when it will immediately light up and continue to adhere so long as the lamp remains lighted, and also when the current is off, provided the lamp is not jarred.

As examples of this mending, note that lamp a in Fig. 18, had one filament broken about three-eighths of an inch from the loop anchor at the beginning of the test. The broken ends were joined together, cutting about  $\frac{1}{2}$ -inch off

filament. The lamp was run at 109 volts, at exactly the same efficiency as the other lamps of the lot, and you will observe that its performance is better than that of lamps b and c. It is still burning after 1,350 hours and has been taken off the test rack eleven different times for measurement, and each measurement has involved a handling by four different individuals in succession. It is apparently good for many more hours of burning. Lamp b, Fig. 8, a 230-volt lamp, was also broken at start, has been measured eleven different times, and the original joint it still good. The abnormal rise in candle power shortly after 700 hours was due to another filament short-circuiting itself, cutting out about three inches of filament, or  $5\frac{3}{4}$  per cent. of the entire length of all the filaments. On the charts a break in the filament is indicated by a cross and a burn-out by a solid circle. You will observe several cases of these circles or crosses on lines that continue on their course as if nothing had happened. But usually the mending necessitates cutting out a greater or less length of filament, and this, of course, reduces the resistance and increases the current, c.p. and efficiency of the lamp, causing a decided change in the direction of the lines representing such lamps. I have repaired a break in a 100-watt lamp by bringing the broken ends together so perfectly that I could, when the lamp was burning, see (through a colored glass) no variation in the brilliancy of the filament at that point. The lamp burned 360 hours without breaking at the joint, during which time it was measured three times, but was finally jarred and broken at the mended spot. It has been five times mended in exactly the same way at the same spot and is still burning, after 1,350 hours. Filaments sometimes burn out or break and mend themselves without troubling anyone.

The tungsten lamp of 17 c.p., 110 v., shown by dotted line in Fig. 7, has a filament less than one-thousandth-inch in diameter, or about one-half the size of a hair of one's head. One filament of this lamp was broken at 300 hours and the broken ends joined together at the break without reducing the length of the filament. The lamp ran in this condition for 384 hours, when it burnt out on another filament. This break was also repaired by bringing the broken ends together without reducing the length of filament. It burned in this



condition for four hours, when it must have received a severe jarring, for the filaments were found broken in five different places. Strange to say the two mended joints were still good and had survived the shock that had broken the unmended filament in five places.

#### Effect of Continuous Running Above Normal Voltage on Tungsten Lamps.

According to Remane, when a tungsten lamp is run five per cent. above that voltage at which its efficiency is, 1.25 w.p.c. (1.1 w.p. Hefner candle), the lamp declines in c.p. 2.68 times as rapidly as when the lamp is run at normal volts (efficiency 1.25 w.p.c.), and when the lamp is run 10 per cent. above normal voltage the c.p. declines 5.36 times as rapidly as when run at normal volts. As some European manufacturers have claimed to supply tungsten lamps to run at an efficiency of one watt per Hefner candle (1.14 w.p.c.) I have taken a high c.p. clear tungsten lamp with broken filament and have run it at such voltage as to make its efficiency one watt per Hefner candle. Fig. 22 shows the performance of this lamp. The initial efficiency of this lamp corresponds to that of a 1.25 watt tungsten lamp running  $4\frac{3}{4}$  per cent. above its normal voltage. According to Remane this lamp should decline in c.p. about  $2\frac{1}{2}$  times as rapidly as a lamp started at 1.25 w.p.c. It declines just 40 per cent. of its initial c.p. in 1,000 hours. Fig. 21 exhibits three lamps of the same size and manufacture, but bowl-frosted. Lamps a and b average 91 per cent. of their initial c.p. after burning 1,000 hours. Therefore, the one lamp in Fig. 22 shows a rate of deterioration over four times as great as the two lamps in Fig. 21.

The repairs of tungsten lamps that have burned out or broken filaments affords an opportunity to study the behavior of the same lamp when operating at different efficiencies. Note the exceedingly rapid drop in c.p. accompanied by very great darkening of the bulb in lamp c, Fig. 21. Its measurement at 500 hours shortly after burning out and being repaired, showed the high efficiency of 1.02 w.p.c. (about 0.9 w.p. Hefner). The c.p. drops in 200 hours from 158 per cent. to 94 per cent. of the initial c.p. Note also the rapid

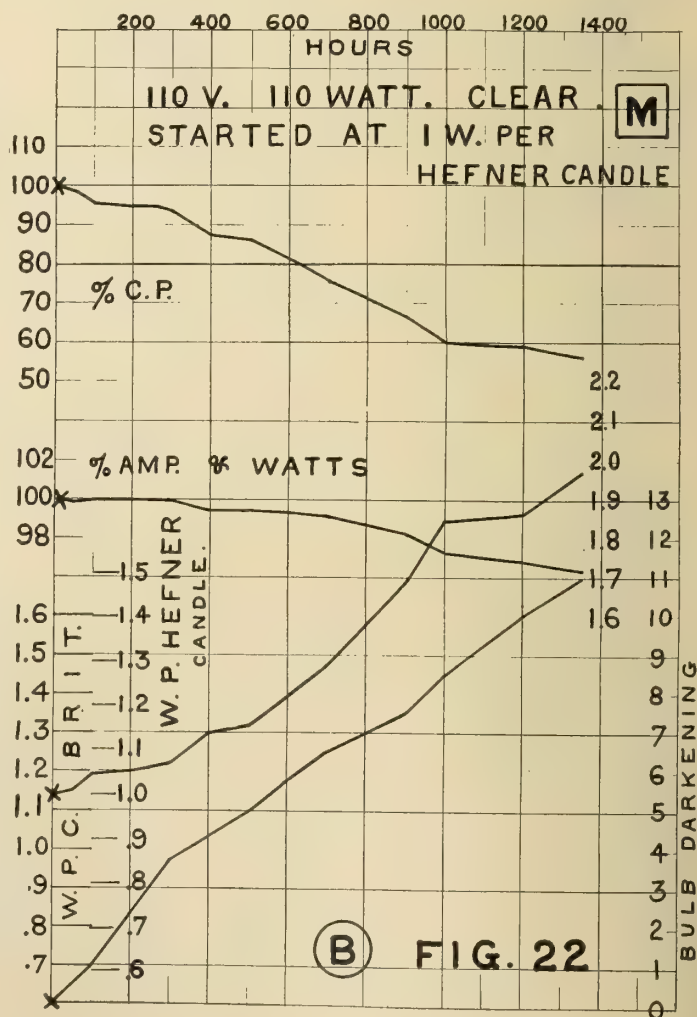
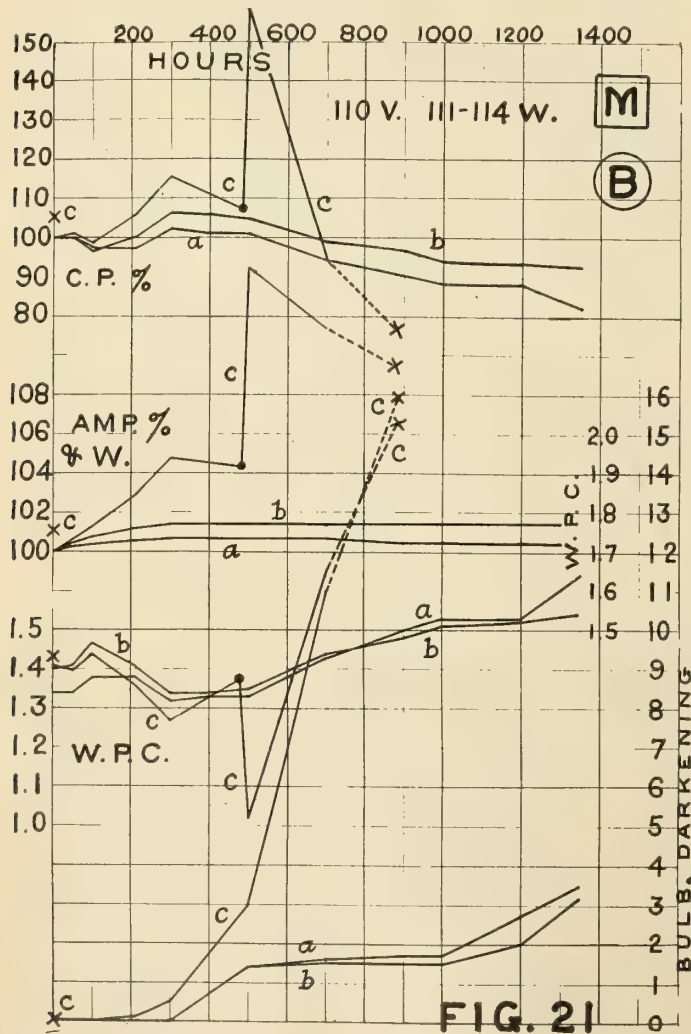
drop in c.p. of lamp a, Fig. 12, after the burn-out and mending had changed the efficiency to 1 w.p.c., or about 0.88 w.p. Hefner candle. This change also was accompanied by very rapid darkening of the bulb. Note also the more rapid drop in c.p. of lamp b, Fig. 8, after a short-circuiting of the filament had raised the efficiency to 1.41 w.p.c. In Fig. 9, lamp b is a lamp designed for 104 volts, at which voltage its efficiency was 1.31 w.p.c., or almost exactly the same as lamp C at 110 v., for which voltage it was designed. Both lamps, apparently of the same quality and received at the same time, were on this test run at 110 v., thus raising lamp b 6 volts (5.75 per cent.) above normal and increasing its efficiency to 1.16 w.p.c. (1.02 w. per Hefner candle).

The curves of b are noticeably different from those of c, and lamp b, burned out, first at 237 hours and finally at 445 hours, burned out in two places so that it could not be repaired, while the 110 v. lamp is still burning after 1,400 hours, having had no burn-outs.

#### High Volt Tungsten Lamps.

These tests show only two lamps of a voltage above 200, namely 230-volt lamps in Fig. 8. These are of much poorer efficiency than the average run of tungsten lamps and therefore might be expected to give a fine performance. Lamp b shows that such lamps, having more filaments than the 110 v. lamps, are subject to the danger of short-circuiting. There are not enough of these lamps to draw any valuable conclusions as to high voltage tungsten lamps, but I would direct your attention to the notable difference in the performance of the average tungsten lamp, as compared with the carbon 220 v. lamp having an untreated filament, which is shown in the same figure. Carbon lamps above 200 v. are generally made by all the lamp companies from untreated filaments, i.e., without the graphitic coating, in order to secure the necessary high resistance. This untreated carbon filament is not nearly so stable as the treated carbon filament shown in Figs. 3, 4, 5, 6 and 7.

It seems safe to conclude from these life tests, as well as from other considerations, that the tungsten lamp as at present made, is not adapted generally to run at much higher



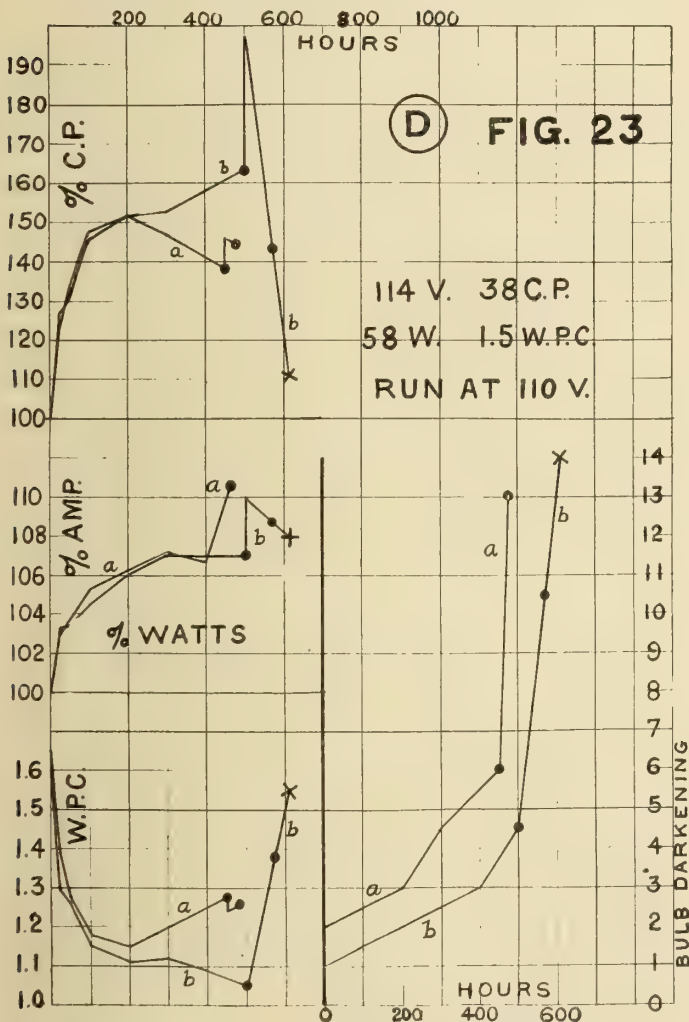


efficiencies than 1.25 w.p.c., or 1.1 w. per Hefner candle. This is the efficiency that has been adopted by the largest makers of tungsten lamps, and there seems to be a tendency on the part of some factories to put out lamps of from 1.3 to 1.4 w.p.c. for 110 v. circuits. It naturally follows that it is unwise to subject tungsten lamps to excessive voltage simply because we have been told that they increase in resistance with increased temperature and are therefore not so sensitive to voltage fluctuations as carbon lamps. While it is doubtless true that fluctuations in voltage of two or three per cent. would cause no appreciable departure from the normal performance of tungsten lamps so long as the voltage averages about normal, it is necessary to keep the voltage well regulated in order to secure the best results. You have however, observed that when the voltage on circuit [S] was raised after 700 hours so as to average about 2 per cent. above normal, the curves of all the lamps on that circuit made a noticeable change in direction. Note, for example, Figs. 14 and 20.

Time will not permit me to discuss all the various points brought out by the curves, but the charts speak for themselves and can be studied at length by those interested.

These tests confirm the claim made for the tungsten lamp as constituting a wonderful advance in the art of incandescent lighting. Many of the lamps here exhibited give promise of showing a phenomenally long useful life, considering their wonderfully high efficiency as compared with that of all other incandescent lamps.

The few lamps that indicate defects in manufacture, simply



emphasize the fact, quite apt to be overlooked by the general public, that this tungsten lamp industry is in its infancy and has just emerged from the experimental stage. New problems, entirely different from those presented by the carbon lamp, have arisen, and have required a vast amount of experimenting in order to solve. It is surprising that, with such formidable difficulties in the way, the tungsten lamp has reached so high a degree of perfection in so short a time. So intensely active are all the lamp factories in this new field of lighting, with several competitors striving to excel one

another, that the tungsten lamp to-day is a great improvement over that of six months ago. Every month brings new improvements in the process of manufacture, and there remains no room for doubt that the tungsten lamp has come to stay and will surely win its way into public favor.

Mr. H. D. Burnett, the writer of the paper on tungsten lamps, was born and educated in Michigan. After finishing a course in Detroit High School, he spent four years at Michigan University, from which he graduated with the degree of B.S. Then spending one year in teaching science and mathematics in Cleveland High School, he entered the Brush



Mr. H. D. Burnett.

Electric Works, leaving Cleveland six months later to accept a position with the Thomson-Houston Electric Company, Lynn, Mass., in their lamp department.

At the time of the amalgamation of the Thomson-Houston and Edison Companies to form the General Electric Company, Mr. Burnett was superintendent of the lamp works of the Thomson-Houston Electric Company. When the lamp works were closed at Lynn and the lamp business transferred to the Edison works at Harrison, N.J., Mr. Burnett came to Canada to take charge of lamp manufacture for the Canadian General Electric Company. He superintended the transfer of that department from Hamilton to Peterboro in 1894, and has been in charge of the lamp works as superintendent from that time up to the present, during which period he has seen the annual shipments of Canadian General Electric lamps increase over nine-fold.

### Automatic Time Switch

Central station men are always interested in devices that assist in raising the standard of plant economy. There have been many instruments recently placed on the market that are very popular with the operating manager for this very reason. Perhaps one deserving of mention is the new style automatic time switch. An illustration of the convenience of this switch is found in England, where they have adopted a lamp post equipped with both arc and incandescent lamps. By means of the time switch the necessity of burning the arc lamps through the long hours of the night is overcome. It is a simple matter to set the switch and automatically change from the arcs to the incandescent system. The firm of Venner & Company, of 6 Old Queens street, Westminster, London, S.W., have placed on the market an automatic clock switch that is giving splendid satisfaction where it has been installed. Mr. J. F. B. Vandeleur, Dineen Building, Toronto, is their Canadian representative.

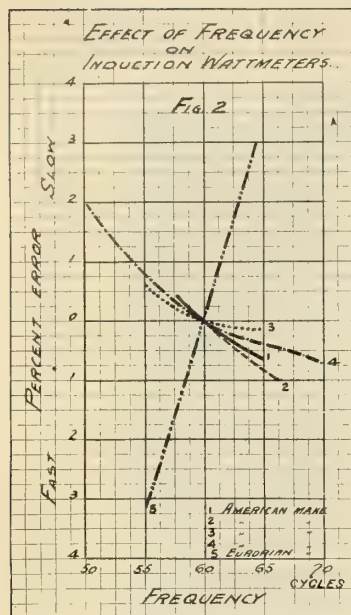
The Canadian General Electric Company, Limited, have issued a pamphlet covering their "No-ark" fuse plugs.



# Measurement of Alternating Current Energy

Necessity for Selection of Proper Current and Potential Transformers—Effects of Phase-Displacements and Power Factor

By M. A. Sammett



The adaptability of alternating current motors to commercial application was readily recognized in the early days of the induction motor. This method of drive is considered now, with some very few exceptions, standard practice. The extensive application of alternating current as a motive power naturally led to the investigation on the part of the supply companies, as well as the purchasers of power, as to the accuracy of electrical measuring instruments, determining the amount of power used by alternating current apparatus.

It is gratifying to all connected with the electrical industry, either as a central station, power transmission company, or as an industrial concern using power, that of all electrical apparatus the measuring instruments, whether indicating or integrating, have reached a surprising degree of accuracy.

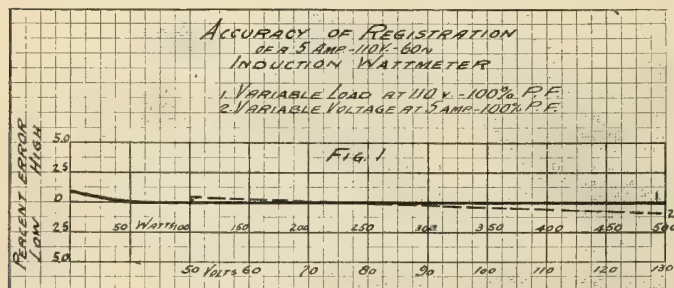
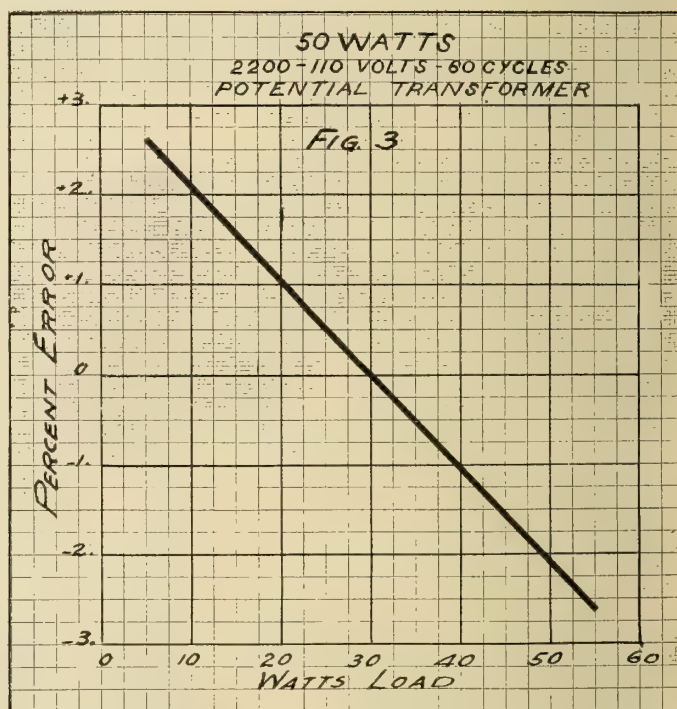
To illustrate the degree of perfection of these meters, reference is made to curves showing the performance of "the induction type" wattmeters under different conditions, figures 1 and 2.

In the development of measuring instruments the refinement was carried probably much further than in any other electrical device or apparatus, and when one considers the various conditions that must be met by alternating current wattmeters which are to give correct registration within a given voltage, frequency, load, wave form and power factor variation, the modern integrating, and especially the indicating wattmeters could be really called the most perfect of all electrical devices. Manufacturers have spared no expense to

volts or higher, is necessarily accomplished by means of using meters on the secondary circuits of translating devices. In other words, the instrument is used in connection with potential and current transformers. These transformers fulfil a very beneficial function, by removing the high tension current from the instrument, and practically adapt one wattmeter for measuring any load, but they introduce errors which must be carefully guarded against. The wattmeter by itself, while meeting the most exacting requirements, when used with transformers will not give a proper registration of power consumption, unless the transformers are selected and tested with as much care as the wattmeters themselves. The errors in the transformers are not generally recognized.

## Potential Transformers

In the instance of potential transformers, reducing high pressure to 110 volts, proper allowance is gener-



attain the standard of perfection which characterizes the recognized makes of the alternating current electrical measuring instruments. Thus, we find that the interests of the supply company and the purchaser were given very careful consideration in the development of the energy measuring instruments.

The measurement of energy when supplied at 2,200

ally made for the drop in the primary coils of the transformers. In other words, the ratio of turns is so chosen as to compensate for the drop in the high tension winding. This compensation for the drop is based, however, on a given supply voltage and sign wave. Operating conditions very seldom correspond to the ideal laboratory conditions and differences of pressure and wave form are more the rule than the exception. Hence errors of transformation are always present. In a potential transformer the load governs the accuracy of transformation, and errors of 4 per cent. from no load to full load may be observed in some instances, as will be found from curve 3. The selection of potential transformers for 25 or 30 cycle service should be made more carefully than for 60 cycle service, inasmuch as the larger exciting currents at the lower frequency cause a greater

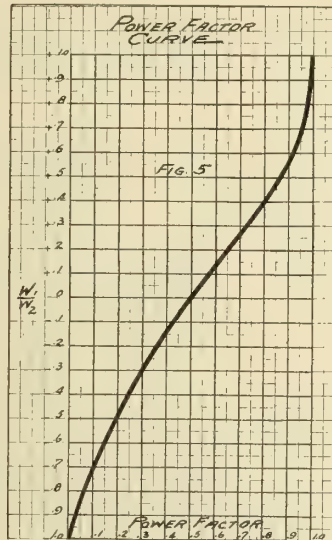
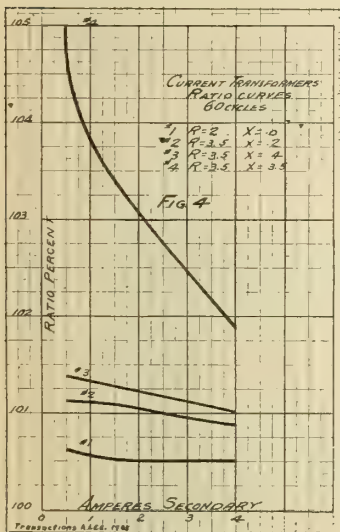


drop in the primary winding. The variation of the supply pressure from the normal voltage will be more pronounced in its effects on the ratio on circuits of low frequency.

The effect of wave form is an important factor in the instance of series transformers, and the power factor of the current bears quite an important relation to the accuracy of current transformation. In the instance of both potential and current transformers, a design permitting of a low exciting current will tend toward greater accuracy of transformation. This, however, must not be attempted at the sacrifice of voltage drop in the potential transformer under load conditions.

#### Phase-Displacement

A point which is very seldom considered, and one which does not easily lend itself to verification, is that of phase displacement in potential and current transformers. This error is always present. Inasmuch, however, as the phase displacement of the potential transformers, is in the same direction as the phase displacement of the current transformer, this error is largely neutralized, provided, of course, that both potential and current transformers are properly selected and have a



minimum phase displacement. In order not to introduce a large error of phase displacement, it is advisable not to use current transformers supplying current to wattmeters for actuating automatic circuit breakers. The inductive load of the electro-magnet actuating the oil switch magnifies the out-of-phase relation in the current transformer, and will thus prove undesirable.

With the exception of errors due to improper installation, wrong connections or errors in selecting transformers of different current capacity, though the ratio of transformation may be right, the meters themselves seldom have a large per cent. of error. Occasionally adjustment of indicating, as well as graphic recording, instruments for proper zero reading will tend to keep the instruments in better calibration. This holds true particularly with curve drawing instruments in which the occasional refilling of the pen and the placing of the paper is likely to get it out of adjustment. The fact that the instruments are highly developed, any repairs or adjustment they may require should never be attempted unless the person is thoroughly familiar with the instrument. Many an error and dispute would be avoided, if the meter when first set up was carefully checked at different loads under actual conditions, during the first few days of operation. Once the accuracy

of the meter is ascertained, there is no likelihood of its going wrong without showing a very pronounced change in the meter registration.

Periodic checks, say once a year, are advisable in order to guard against any possible cause for the meter speeding up, as may be the case in some rare instances, when the retarding magnets of the induction type wattmeter weaken, thus allowing the meter to register higher than under normal conditions. A frequent occurrence in induction type wattmeters is the increased friction due to wear of jewel or presence of dirt, resulting in lower registration.

#### The Power Factor

In connection with all power installations the question of power factor is very important. Supply companies, as a protection against the use of inferior apparatus, or against the use of motors of large capacity operating at fractional loads, specify a minimum power factor and the user of power is charged a higher rate in the event the power factor is below a specified minimum of 75 per cent. or 85 per cent., whatever the case may be. The question of power factor, therefore, is one it is desirable frequently to ascertain without any other instrument on hand than the polyphase indicating or curve drawing wattmeter.

The two wattmeter readings of the polyphase instrument enable one to arrive at the results, if provision one phase and opening the series coil of the wattmeter connections corresponding to that phase. To obtain accurate results it is necessary that a single and polyphase readings correspond to the same load; in other words, that the load remain constant while the readings are taken. With this information the two separate wattmeter readings can be arrived at and the smaller wattmeter reading divided by the larger wattmeter reading will give us a percentage ratio which will permit by means of curve shown on figure 5 to determine the power factor of the load.

A study of the curve expressing ratio of wattmeter reading and power factor shows how much more reliable this method is than the one of energy divided by K.V.A., especially when the range between 80 per cent. and 100 per cent. power factor is considered. It is preferable, however, to obtain two wattmeter readings simultaneously and two separate single phase wattmeters should be used on a three phase circuit whenever possible. The simplicity of this method at once appeals to everyone who has occasion to make use of it, and the writer has resorted to it frequently for a number of years and found this method invariably very satisfactory.

While the curve gives strictly accurate results when the pressure is of a sign wave, the discrepancy as observed on a number of tests under commercial conditions is such as to consider the error negligible. Another objection raised against the two wattmeter method for determining the power factor of load is that with unbalanced loads it is not sufficiently accurate, but inasmuch as all loaded induction motors form a balanced load, unless the supply pressure is appreciably unbalanced, the method is one that will find considerable application.

At the annual convocation of McGill University, Montreal, for the conferring of degrees, it was announced that \$60,000 had been promised by several Montreal gentlemen for the purpose of endowing a professorship in the Faculty of Applied Science. With it will be associated the name of the late Professor Bernard J. Harrington. Mr. R. B. Angus also recently donated \$25,000 to the university's funds.



# 110,000 Volt Transmission Line at Grand Rapids

## Interesting Description of the Successful High Transmission System of the Grand Rapids-Muskegon Power Company

In view of the interest taken in the projected high tension lines of the Ontario Hydro-Electric Power Commission, a description of the transmission system of the Grand Rapids-Muskegon Power Company, of Grand Rapids, Michigan, should prove doubly interesting. It is the intention of the Ontario Commission to ultimately



View of Transformers—Grand Rapids-Muskegon Power Development.

transmit 100,000 h.p. at a pressure of 110,000 volts, and to distribute it throughout a wide area in the province. The transmission lines of the Grand Rapids-Muskegon Power Company are at present carrying 110,000 volts pressure, which is at present the highest working voltage of any development company. While in reality their transformers are designed for 100,000 volts, they are being safely operated at 110,000 volts, or ten per cent. above rated voltage.

The Grand Rapids-Muskegon Power Company utilizes the water power of the Muskegon and Grand rivers to furnish light and power for the neighboring cities and interurban railways. They have in all 212 miles of transmission, and their newest 110,000 volt line extends from the Croton dam on the Muskegon river to their Wealthy avenue sub-station at Grand Rapids, a distance of fifty miles.

For a year or more the 72,000 volt lines of the Grand Rapids-Muskegon Company had remained the highest operating voltage of authentic record, in spite of the fact that a California company claimed to be operating at 80,000 volts. Their lines were really designed for this pressure, but their engineers are understood to admit that 57,000 volts was their highest actual working voltage. There are, of course, quite a number of lines in use that are operated at a voltage in the neighborhood of 60,000.

The success that the company met with in operating at 72,000 volts brought to their view the possibilities of a higher voltage transmission system, and it was decided to experiment along these lines on the new Croton dam-Grand Rapids transmission. At Croton dam two 7,000 horse-power hydraulic turbine-gen-

erator sets utilize the head of 41 feet, generating 30-cycle current at 7,200 volts. This is stepped up through three 3,750 kilowatt transformers to 110,000 volts, and transmitted over the steel-tower line to Grand Rapids, where a similar set of transformers receives it, lowering the potential to the sub-station bus-bar voltage of 7,200, as well as supplying a 20,000-volt transmission line to an interurban sub-station. The Croton dam on the Muskegon river is near the junction with the Little Muskegon and seven miles from the railroad station of Newaygo. Construction work was begun in June, 1906, and as a foundation 3,000 oak piles and two rows of heavy interlocking steel sheet piling 30 to 36 feet in length were sunk below the river bed. The dam and power house are of reinforced concrete construction, the wheelhouse forming a part of the buttress. The concrete core wall of the dam is 300 feet in length and 42 feet high, set upon a foundation of steel piling. Two hundred feet down the stream from the flood gates there extends an apron of reinforced concrete from four to two feet in thickness.

The working head of the development, 41 feet, is maintained by eight steel tainter flood gates, each 13 feet by 20 feet, and a bear-trap or movable crest dam 40 feet long. The power house has a floor area 75 by 125 feet, and is 60 feet high. Reinforced concrete walls protect it from backwater, and the wheel section is of concrete construction for the lower 40 feet. Two sets of eight 45-inch Samson water wheels mounted on horizontal 12-inch by 110-foot steel shafts drive the two 7,000 horse-power Westinghouse three-phase generators



Wealthy Avenue Substation at Grand Rapids—110,000 Volt Transmission Line.



at 225 revolutions per minute, supplying 30-cycle current at 7,200 volts.

At the site of the dam the river valley is about 600 feet wide, with banks 40 to 120 feet high, respectively. The waste-gate section of the dam is 238 feet long and its outer end adjoins the power house, which, with the turbine room, is 160 feet long. A fill embankment completes the remaining 200 feet of the dam across the valley. The dam required 30,000 barrels of cement and 1,250 tons of steel in its construction, and impounds the waters of the Muskegon river to form a pond nine miles long and covering 1,600 acres.

The tainter waste gates at the Croton and Rogers dams are of interest, as they were of special design. The gates are separated by massive concrete piers, and each closure swings on two bearings, six-inch cold-rolled steel pine embedded in the piers. As the gates are well trussed there is no central bearing or through shaft needed. Each gate is fitted with a heavy oak block seating on a wooden sill carried on a 15-inch channel-



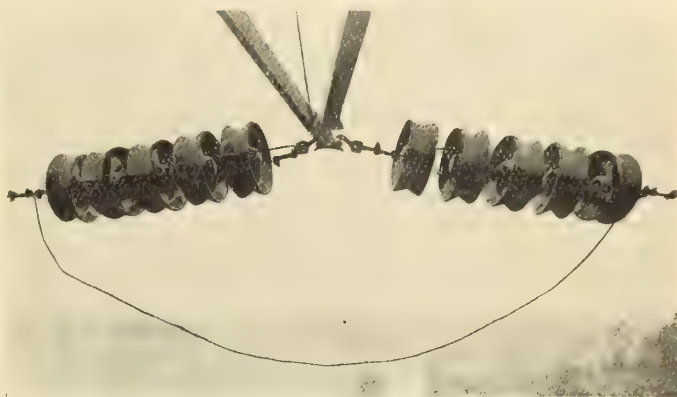
Suspension Type Insulator used on the 110,000 Volt Line.

iron embedded in the concrete. The joints are made watertight by attaching five-inch strips of three-ply rubber belting on the up-stream face of the gate, so that the pressure of the water makes a watertight joint. The gates are controlled by motor-driven hoisting crabs. The movable crest section has a vertical travel of  $3\frac{1}{2}$  feet and is operated by two motor-driven hoists.

On the down-stream side of the generator room are placed the three 3,750 kilowatt step-up transformers. These are water-cooled and oil-insulated and serve to step-up the generator voltage of 7,200 to the transmission potential of 110,000 volts.

The wires are carried by Hewlett suspension type, five-part insulators on large tripod steel towers having a tetrahedral form of bracing. These towers are 53 feet in height over all and 43 feet 8 inches from the ground to lowest cross-arm, which are designed to give a 40-foot clearance between the live wire and the ground. They are spaced 500 feet apart on the straight course and their bases are cemented into concrete anchors buried in the ground. The towers weigh approximately

1,700 pounds each and provide a minimum spacing between the insulator hangers of eight feet. The line transmits 10,000 kilowatts and stranded conductors with hemp centre and having a carrying capacity equivalent to No. 2 wire is used. The insulators are of the standard General Electric disk pattern, the suspension-type being used for straight support and the strain-type for pull offs and curves. Five of these 10-inch disks are used in series, each disk being rated at 25,000 volts. They are tested up to 95,000 volts, so that the total



Strain Type Insulators Used on the 110,000 Volt Line.

break-down voltage of the series is almost half a million volts, giving a factor of safety of nearly five. This is a valuable feature of the suspension insulator, since in the case of one, or even several, of the disks being broken, the remaining insulators in the set enable the line to continue operating without interruption. A 50-mile transmission line operating at the enormous potential of 110,000 volts presents some interesting and unusual electrical phenomena. Owing to the static discharge at this potential a continual noise or buzz is heard in the neighborhood of the high tension line. This



Showing the Steel Towers used in the Grand Rapids-Muskegon Towers.

30-cycle note can be heard distinctly at a distance of 100 feet.

In the dark the 110,000-volt wires appear luminous with a brush discharge distributed over their entire length. This luminescence is about of the quality of a rubbed phosphorous match, though at places where dust or some irregularity forms a discharge point a more brilliant brush display is produced.

While 110,000 volts is the sustained line potential, even this value is often exceeded, for a range of a few



thousand volts on the line is comparatively close regulation. With a slight swing of the voltmeter needle the brush discharge changes visibly, increasing in brightness out of proportion to the voltage change.

Ordinary effects of capacity and the line characteristics are greatly exaggerated in a line of such effective insulation and operating at this extremely high voltage. For instance, a slight wind blowing across the disconnected line serves to charge it to a very high potential. Whether from frictional electricity developed by the motion or from the drifting of charged masses of air or clouds against the line, sparks an inch in length may often be drawn. This was a troublesome cause during the construction of the system, as the linemen continually received slight shocks from the open line unless the wires were tied together and grounded.

In view of the present difference of opinion in relation to lightning protection the fact is worthy of note that the 110,000-volt line is provided with neither lightning arresters nor a ground wire. There are no operating switches in the 110,000-volt circuit, the high-tension windings of the two sets of transformers 50 miles apart being permanently tied together. The operation of this line without lightning arresters or ground wires has so far provided a record very encouraging to those who do not admit all the advantages of such protection. To date the 110,000-volt line has given less trouble, it may at least be said, than the 72,000-volt circuit, which is provided with both arresters and a ground wire throughout its length; and the new line has already successfully weathered one of the most severe storms that ever visited the Grand Rapids region.

At the Croton power house the 7,200-volt primary circuits of the 110,000-volt transformers are controlled by Westinghouse 300-ampere type E oil circuit-breakers. With no further switching connection in the transmission circuit the three 3,750-kilowatt transformers at the Wealthy avenue sub-station supply a 20,000-volt transmission line to the sub-station of the Grand Rapids. Holland & Chicago Electric Railway as well as the 7,200-volt station bus-bars connected to the downtown Grand Rapids sub-station. These enormous 110,000-volt transformers are shown in the interior view of the Wealthy avenue sub-station. A comparison of their gross dimensions with the chair in the photograph will furnish an estimate of their great size. They measure 19 feet in height and 15 feet in diameter. The 110,000-volt primary terminals, which are plainly shown in the photograph, are connected in delta to the wires of the transmission line and carried overhead into the building. The oil switches which handle the 20,000-volt and 7,200-volt circuits are motor controlled and in accordance with modern practice are indicated on the switchboard by lamps.

As a matter of test, when the 110,000-volt line was finished building, but before connecting to the transformers at Croton, the dead-ended line was energized from Grand Rapids and the reversed readings of the station watt-hour meter taken. As an average of 52 hours a value of 152 kilowatts an hour was obtained, representing the total leakage and charging losses of the line and the exciting and other losses of the one set of transformers.

In view of the many troubles experienced by the large majority of companies when first starting a high tension transmission line using pin insulators, a report made on the operation of this line is of special interest. This report states that "this line has been in operation since July 18th, 1908, and we have experienced no trouble whatever. Nothing of an unusual nature has oc-

curred and we consider its operation as very satisfactory and successful."

The Grand Rapids Company have recently decided to insure a continuous service for their customers, and with this in view have just taken out a permit for the construction of a \$20,000 brick steam power house not far from their Wealthy avenue sub-station. This is but the beginning, for ultimately the company will have an auxiliary steam plant capable of developing 30,000 h.p. to be used for special service during low water period of the year and in case the unexpected should happen and the power lines be out of commission.

## Successful Electrical Engineers

The results of the recent examinations held at the Universities of Toronto, Queens and McGill have recently been issued and there are now a much larger proportion of electrical engineers, ready to take up engineering as a means of earning a livelihood, than heretofore. A number have been granted an electrical degree and a still larger number are eligible for a diploma. The graduating class in Applied Science at Toronto lost all chance of obtaining honors by refusing to do part of their practical work in Machine Design. They will have to complete this work before they are eligible for a diploma. The results:

### McGill University.

R. H. Mulock, Canadian Society of Civil Engineers' prize for best paper of the year in the electrical section, and prize for summer essay; D. L. McLean, British Association, medal and prize, honors in electrical engineering; Herbert B. Dwight, British Association medal and prize, honors in electrical and mechanical engineering and thermodynamics; W. F. McNight, first prize for paper read before Undergraduates' Society of Applied Science, honors in electrical engineering; Arthur J. Soper, honors in electrical engineering. Pass list—L. W. Allen, W. O. Briegel, A. F. Briggs, C. Cate, H. Davis, A. E. Dickinson, G. B. Edwards, A. N. Fraser, D. M. Gall, A. M. Lindsay, T. H. Lundy, W. Falconer, A. A. Murphy (B.Sc. Queens), S. M. Smith, C. T. Trotter, A. Wilson.

### University of Toronto.

Those who obtained the degree of B.A.Sc.: With honors—W. L. Amos, H. Coyne, C. L. Gulley, J. N. M. Leslie. Pass—H. G. Akers, P. H. Buchan, A. W. Campbell, K. Hall, A. N. Hunter, J. B. Minns, J. H. Morice, C. F. Publow, W. E. V. Shaw, H. F. Shearer, R. H. Starr, V. C. Thomas, R. M. Wedlake, W. J. White.

Graduating class—H. V. Armstrong, R. D. S. Beckstedt, A. M. Bitzer, D. C. Blizzard, G. H. Bowen, C. E. Brown, R. A. Campbell, H. A. Cooch, T. H. Crosby, R. H. Cunningham, H. W. Davis, W. P. Derham, T. A. Fargey, T. E. Freeman, F. G. Hagerman, R. H. Hall, C. J. Harper, J. Hemphill, A. E. Holmes, C. R. Holmes, H. Irwin, J. Isbister, F. P. Jackes, J. B. O. Kemp, A. W. Lamont, A. E. Lennox, D. D. McAlpine, C. R. McCollum, A. S. McCordick, P. J. McCuaig, J. H. McKnight, E. D. Macfarlane, B. A. Maclean, G. Morton, V. J. O'Donnell, J. J. O'Hearn, W. M. Philp, C. J. Porter, A. I. Proctor, L. T. Rutledge, R. A. Sara, A. Schlarbaum, C. E. Schwenger, M. W. Sparling, S. Stroud, E. A. Thompson, W. G. Turnbull, F. C. White, A. R. Whitelaw.

### Queen's University

Graduating class—J. C. Daley, Ottawa; W. O. Dwyer, Kingston; D. S. Nicol, Cataraqui; O. M. Perry, Perth; F. H. Ryan, Newburgh; T. B. Spiers, Appleton; S. A. Woods, Tamworth.



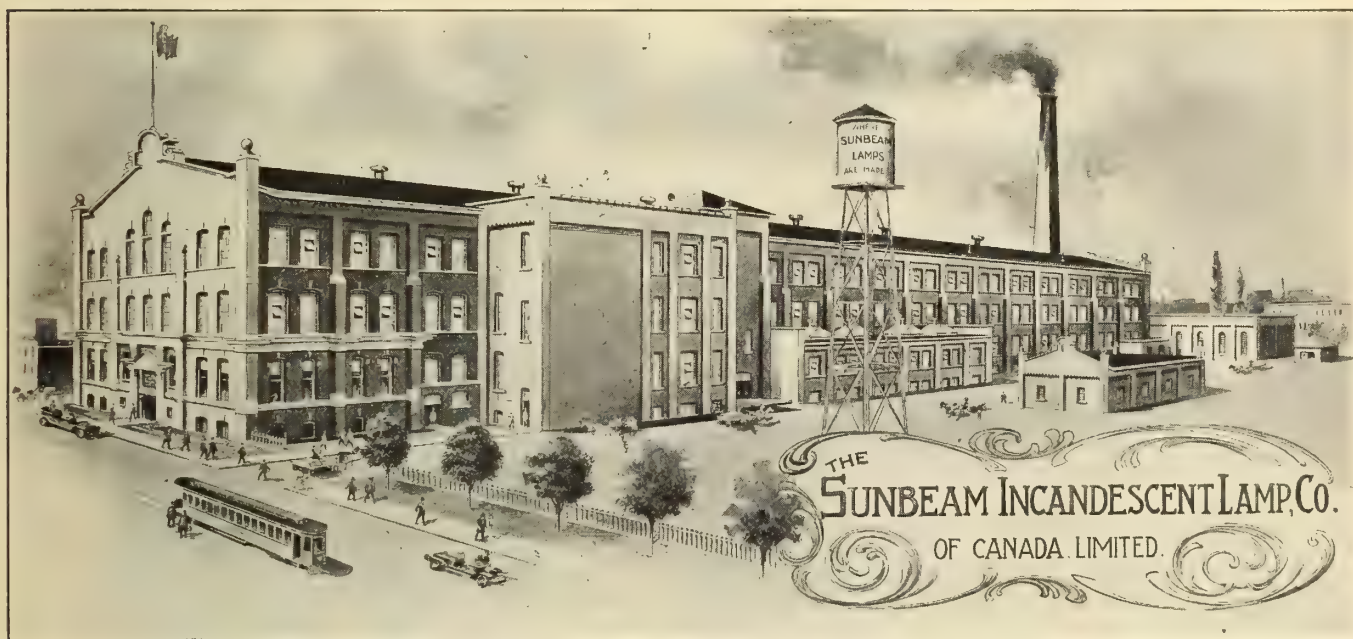
## Modern Lamp Factory

The newly-completed factory of the Sunbeam Lamp Company, at Dufferin and Liberty streets, Toronto, is modern in every sense of the word. The architect, Mr. F. H. Herbert, was given free scope, and the artistic results achieved are such as very seldom found in factory buildings. Entering the interior, one is at once impressed with the finely finished office apartments of the manager. The rooms are elaborately finished in quartered oak; the walls are decorated with a six-foot strip of bronze burlap, and the lighting is effected by the use of neat tungstoliers. Leading from the business office are the dining-room and private rooms of the manager. In the latter are found every convenience, even a modern shower bath finding its place there. Next to the manager's suite of rooms is that of the superintendent, and across the hall the office staff is accommodated. These rooms are finished throughout in varnished Georgia pine.

Passing from the business apartment, on the same floor are found the frosting room, the storage batteries,

leads to the gas chambers, where the hydrogen gas used in treating the tungsten lamps is evolved. In the basement are found the pumping and compressing units. The kitchen and dining-room, supplied for the convenience of the office staff, are also located here. On the other floors are made the different varieties of tungsten lamps, including train lighting, miniature, and low voltage sign lamps.

The building is four storeys in height and occupies a floor space of 67,200 square feet. It is semi-fireproof construction throughout, with the improved self-closing fire doors. The wiring is enclosed in conduit, with a panel switch box for every floor. The Sheldon Multivane Blower system of purifying the air is used. In the summer the air is washed and cooled every eight minutes, in the winter it is washed and warmed. In every detail the new factory of the Sunbeam Lamp Company is up-to-date and sanitary. Much more could be said about this plant, but owing to the management being very busy preparing for the starting of operations, further details could not be obtained. A more complete description will appear in a later issue of this journal.



New Factory of the Sunbeam Lamp Co.. Dufferin and Liberty Streets, Toronto.

used to obtain an absolutely even voltage for measurement of the lamps. A small motor generator set, made by the Western Electric Company, is used in charging these accumulators. This floor will also be used extensively as a stock room.

In the north-east corner of the basement, the boiler room is located. Here a 216 h.p. Robb Engineering Company water tube boiler is installed and provision has been made for the reception of two more at a future date. Directly opposite is the power room, about 35 feet by 45 feet. Three-phase current is received from outside at approximately 600 volts, and transformed to 110 volts, for motor and lighting use. The switchboard consists of four panels of blue Vermont marble, running to the floor. One of the panels receives the three-phase current from the transformer, two others are for lighting and motor distribution, while the fourth is the motor generator panel. Two motor generator units are in use, one 25 h.p. set is employed in operating the elevators and a 50 h.p. outfit supplies the direct current used in the process of manufacturing the lamps. From about the centre of the basement an underground passage-way

## Inspection of Wiring

The fifteenth general meeting of the American Electrochemists' Society, held at Niagara Falls, Ont., May 6th to 8th, was a splendid success, both in point of attendance and in the interest manifested in the papers read. All the large steel companies were represented. Interesting papers were delivered on the electrometallurgy of iron and steel. During the meeting Dr. E. Haanel, Canadian Director of Mines, outlined his recent visit to Sweden, describing the new electric reduction furnace at the Ladvika, now used in a commercial way.

## A Good Year for Cable Company

The financial statement of the British Insulated & Helsby Cables, Limited, shows that company to have had a splendid year's business during 1908. Their profits for the year were £193,831 17s. 10d., and after meeting all accounts and paying dividends on both ordinary and preferred shares £81,004 was placed to the credit of profit and loss account.



## Personal Mention

Mr. P. W. St. George and Mr. C. M. Strange were recently elected to the executive board of the Engineers' Club of Montreal.

Professor Herdt, of McGill University, Montreal, has been retained by the city of Winnipeg to report upon the electrification problem.

Mr. J. H. Gunther, manager of the Bell Telephone Company, Listowel, has entered the electrical contracting field in that town.

Mr. Charles Brandeis, of Montreal, has been appointed consulting engineer for the waterworks department at Pointe aux Trembles.

We learn with regret that Mr. A. B. Lambe, of the Canadian General Electric Company has been suffering from a severe attack of sciatica.

Mr. W. B. Redfern, B.A.Ss., who recently graduated from the University of Toronto, has joined the staff of Mr. Willis Chipman, consulting engineer, Toronto.

Mr. W. S. Skinner has been appointed by the city of Moose Jaw, Sask., consulting engineer in connection with the installation of the light and power system.

Hon. Adam Beck sailed on May 28th for a month's visit to England. During his absence Hon. J. S. Hendrie will be acting-chairman of the Ontario Hydro-Electric Power Commission.

Mr. F. B. Mansbendell, of the Hydro-Electric Power Commission, sailed recently for Europe, via the str. St. Louis. Mr. Mansbendell will make an exhaustive study of the insulation methods in vogue on the Continent.

Mr. Thos. R. Fulton, formerly eastern representative for the Eugene F. Phillips Electrical Works, succeeds the late Mr. Thomson as their Ontario manager. He will be located in the Traders Bank Building, Toronto.

Mr. Willis Chipman, consulting engineer, 103 Bay street, Toronto, who for the past six years has conducted several branch offices throughout the western provinces, has opened an additional office at Canada Life Building, Winnipeg.

Mr. F. Jno. Bell has resigned as a director and secretary-treasurer of the Canadian Crocker-Wheeler Company, Limited, Montreal. Mr. Bell has been connected with various engineering and commercial ends of the electrical business throughout Canada for many years.

Mr. P. W. Sothman, chief engineer of the Hydro-Electric Power Commission, sailed on May 20th, via Red Star Line's str. Lapland for Europe. Mr. Sothman will be away seven weeks and will gather the latest engineering methods, for the Commission's high voltage system.

Mr. Charles C. Starr, who for the past five years has been manager of the Halifax office of the Canadian Westinghouse Company, has resigned, having been elected president and managing director of the John Starr, Son & Company, Limited, Halifax, N.S., a well known electric supply and contracting house.

On July 1st a change will take place in the management of the Smith Falls Electric Company, Smiths Falls, Ont. Mr. John Davidson, superintendent for many years, has resigned and will be succeeded by Mr. A. S. Fraser, at present in charge of the power plant of the Frost & Wood Company, and Mr. Wm. Henderson, now manager of the waterworks department.

The firm of Smith, Kerry & Chace are unusually busy

and have made a number of additions to their Toronto office staff. The recent arrivals are Mr. Arthur Hull, graduate S.P.S., and formerly with the Canadian Westinghouse Company; Mr. Arthur J. Soper, recent honor graduate McGill University, and formerly for several years employed with the General Electric Company, of Schenectady, as electrical expert, and also with the Electrical Development Company at Niagara Falls, Ont.; Mr. Alvin Schlarbaum, recent graduate, University of Toronto. Mr. Schlarbaum is a practical man, having served an apprenticeship with the Goldie & McCulloch Company, Limited, of Galt, Ont. All these gentlemen will be employed in the electrical department. Mr. F. M. Byam, structural steel department; Mr. K. R. McKinnon, McGill graduate, mechanical department; Mr. L. M. Jones, formerly assistant city engineer at Port Arthur, surveys department.

## Obituary

John P. Thomson, Toronto representative of the Eugene F. Phillips Electrical Works, died at his home in Toronto on May 14th. He was thirty-one years old at the time of his death and was widely known to the



The Late John Thompson.

electrical trade throughout Canada. Mr. Thomson had been connected with the Eugene F. Phillips Company for the past twelve years; his business career practically commencing with them. His early work with this firm called him to Montreal, but for a number of years he has represented them in Toronto. Mr. Thomson was held in high esteem by those who came in contact with him, and his early death is deeply regretted.

The sympathy of the entire electrical fraternity will be extended to Mr. Frederick Nicholls, second vice-president and managing director of the Canadian General Electric Company, who recently sustained an irreparable loss in the death of his wife. Mrs. Nicholls left besides her husband, a family of four sons and three daughters. Death was due to an unexpected attack of apoplexy, and her untimely demise came as a shock to her large circle of friends.



## The Thetford Mines Award

To the Editor of the "Electrical News":

Dear Sir,—The letter of the third arbitrator quoted by Mr. R. S. Kelsch in support of his own statement, that the arbitration award was made in full in favor of the Shawinigan Water & Power Company, puts the matter in a very clear light. It is to be regretted, however, that Mr. J. M. Robertson's letter was not quoted in full.

The mining companies complained of the service and asked for arbitration. Their grievances were (1) Nature of service; (2) Damages, etc.

The necessity for an improvement of service was of primary consideration. To impress on the Shawinigan Company the gravity of the situation, the Mining Companies asked for a reimbursement of damages suffered by them as a result of inadequate service. Mr. Robertson, after stating that no damages were paid, says further: "This (non-payment of damages), however, does not take into account the question as to whether there was any reason for dissatisfaction."

It is clear, therefore, that the claim of primary importance made by the Mining Companies as to the nature of service was demonstrated by them beyond any doubt as far as the third arbitrator is concerned.

Hence my contention that the finding was not entirely in favor of the Shawinigan Water & Power Company is well founded, and Mr. J. M. Robertson's letter bears me out in my contention. As a further proof of my position, I wish to say that the contracts were modified and made more in accordance with the wishes of the mining companies, thus showing that the Mining Companies' grievance was justified and the supply company was ready to improve the service.

Yours very truly,

M. A. SAMMETT,

Arbitrator for the Mining Companies.

Montreal, May 17th, 1909.

## A Single Phase Meter

The principle underlying the action of this single phase meter is similar to that involved in an ordinary induction motor, and is gauged to measure accurately the energy consumed on an alternating current circuit, whether the load is inductive or non-inductive. The current passes through the series coils of heavy wire, and the shunt current is taken care of by a coil of fine wire. The magnetism due to load current is practically in phase, while the magnetism due to the shunt current, acts on the disc, with a lag of 90 degrees behind the e.m.f. impressed at the terminals of the shunt coil. The interaction of the two magnetic fluxes causes the disc to rotate as in a two-phase induction motor; the retarding torque is due to the permanent magnet and is proportional to the speed of rotation. This meter is placed on the market by Ferranti, Limited. G. C. Royce, 22 Dundas street, West Toronto, is their Canadian representative.

## New Underwriters Rules in Toronto

The Canadian Fire Underwriters propose to standardize rule 24 (s) of the National Code, which calls for the use of iron conduit on brick walls. This rule has been adopted and is now in force in Montreal, and the method heretofore adopted of running flexible loom down the walls and burying the same in wet plaster is to be discontinued. This refers practically to bracket outlets in connection with knob and tube work and must be arranged so that the wires can be withdrawn or inserted in the same manner as for conduit work. This is accomplished by providing all bracket outlets with proper outlet boxes and running the conduit to the nearest

pendant outlet, at which point another outlet box must be provided, or the pipe may be run to the nearest centre of distribution, where it can enter the cut-out cabinet. This will facilitate the insertion or withdrawal of wires. These conduits should be grounded according to the rules already laid down governing that particular branch of the work. This rule is to take effect on June 1st.

## Inspection of Wiring

The Canadian Fire Underwriters have sent Mr. B. Vanwinkle to London, Ont., to inspect and report upon the condition of all mercantile risks in that city. Owners of defectively wired buildings will be expected to bring them up to the standard required by the Underwriters. In his recent visit to Peterboro, Mr. Vanwinkle succeeded in effecting a large number of changes in the wiring conditions; the usual defects, found in older styles of wiring, being very much in evidence.

The large volume of new building operations in progress in Toronto is keeping the Underwriters extremely busy and the present staff is hardly adequate to keep abreast of the demands made upon it.

## Erratum

In our description of the Edmonton plant in our May issue the paragraph under "New Engines to be installed before July, 1909" should have read: "One 1,800 h.p. manufactured by Goldie & McCullough; one 450 h.p. Robb-Armstrong vertical type, manufactured by the Robb Engineering Company; one 600 h.p. Robb-Armstrong vertical type, manufactured by the Robb Engineering Company, and one 600 h.p. vertical type, manufactured by Bellis & Morecom, England."

## The World's Playground

No where else in the world can the health and pleasure seeking summer tourist enjoy so much for so little money as in the Muskoka Lakes District, Highlands of Ontario, Canada. There is nothing anywhere else quite like Muskoka; to those in search of a purely scenic beauty there is no other spot in the universe to rival it. It is one of those gorgeous pictures of nature which defy the power of creative genius to depict; nature was certainly prodigally extravagant in creating Muskoka. The air is clear and dry owing to the altitude being about 1,000 feet above the sea level. Hay fever and asthmatic victims find immediate relief.

Amid miles of inland lakes are thousands of picturesque islands on which are located over 100 hotels and boarding houses, with prices ranging from \$5 to \$35 per week, the better known of these hotels being the "Royal Muskoka," (golf, tennis, fishing,) the largest, finest and most comfortable house in Canada.

The Lakes, 112 miles from Toronto, are reached by a magnificent train service on three lines, the Grand Trunk, Canadian Northern, and Canadian Pacific Railways, these having direct connections from all points in Canada and the United States.

Through ticketing arrangements are in effect with all railway and steamship lines in Canada and United States. Twice daily mails; telegraph and telephone service.

The Packard Electric Company Limited have issued a very complete and instructive bulletin dealing with transformers of special design for electric smelting, which will no doubt be found of great interest to engineers and those interested in electric reduction work of all kinds. A copy of this bulletin will be mailed promptly on request.



## One of Our Contributors

Mr. M. A. Sammett, contributor of the paper on "Measurement of Alternating Current Energy," is a graduate of the University of California, '99. His first experience in the electric line was obtained with the General Electric Company, at the Schenectady works. On completing the course in the testing department, he joined the engineering staff of the same company, and was associated with Mr. W. S. Moody, of the transformer engineering department.

In 1902 Mr. Sammett joined the engineering staff of the Lachine Rapids Hydraulic & Land Company, and after the amalgamation of the electric companies, was placed in charge of the testing department of the Montreal Light, Heat & Power Company. In this position he was in close touch with electrical manufacturing centres, such as Schenectady, Pittsburgh, Hamilton, Rockfield and Peterboro, representing the interests of the Power Company on acceptance tests of apparatus.

Mr. Sammett's experience in acceptance testing has kept him abreast with modern electrical development and his entrance into the consulting engineering field is but a logical outcome of his many connections with operating and industrial companies with whom he was associated for some years past. Frequent contributions to the technical press of the United States and Canada, and the reading of papers before



Mr. M. A. Sammett, Montreal.

engineering societies, have made Mr. Sammett well known to the electrical fraternity.

Mr. Sammett is a member of the C.E.A., associate member C.S.C.E., and A.I.E.E.

## Publications Received

A new multi-catch socket manufactured by the General Electric Company is described and illustrated in neat booklet form.

The Westinghouse Electric & Manufacturing Company have recently placed on the market a neat combination toaster-stove.

Tungsten fixtures and accessories are outlined in Bulletin No. 4, issued this month by the Benjamin Electric Manufacturing Company

The Brown & Sharpe Manufacturing Company, of Providence, R.I., have issued their 1909 catalogue. It is as usual a veritable machinists' tool guide.

The latest advances in induction motor practice are described in Bulletin No. 102 just issued by the Packard Electric Company, St. Catharines, Ont.

## How to use a Bridge-Megger

To many operating men not familiar with their use, the new type bridge-meggers, that are rapidly supplanting the older forms of resistance measuring instruments, present many mysteries. In reality these meggers do not involve any special difficulties but are quite simple of operation. Mr. J. F. B. Vandeleur, of Toronto, has kindly placed at our disposal an instruction sheet for use with the Evershed Bridge-megger, and we publish it in the hope that its general form will make it serviceable to our readers.

To measure the unknown resistance of a conductor of less than 10,000 ohms connect up as in fig. 1. Set the change-over switch to "Bridge," and the ratio switch to unity. Put

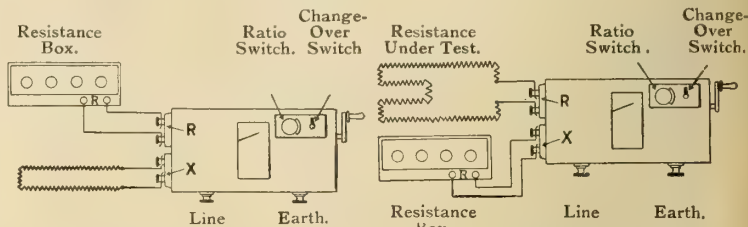


Fig. 1.

all the resistance box dials to zero. Turn the generator handle at a moderate speed, clockwise, with your right hand, while with the left hand you raise the value of R step by step by turning the resistance switch; beginning with the thousands and going on to the hundreds, tens and units, in regular order, until the megger index indicates a balance by standing at the mark G. The value of the resistance under test is that shown by the dials of the box. If the resistance prove to be under 100 ohms, set the ratio switch to 10 and putting the dials back to zero obtain a fresh balance. The value of the resistance under test is now equal to the box reading divided by 10. If the resistance prove to be under 10 ohms set the ratio switch to 100 and obtain a balance. The value of the resistance under test is now equal to the box reading divided by 100. When the approximate value of the resistance is known, set the ratio switch to 1, 10 or 100 according as the known value is over 100, under 100, or under 10 ohms. A single test will then give the required result. If the resistance is more than 9,999 ohms, connect up as in fig. 2. Set the ratio switch to 10 or to 100, according as the resistance under test is under 100,000 ohms or over 100,000 ohms. Obtain a balance, and the value of the resistance is now equal to the box reading multiplied by 10 or by 100 as the case may be.

As an alternative, conductor resistances over 10,000 ohms may be measured by setting the change-over switch to megger, connecting up as in fig. 3, and making a simple megger test by direct reading of the megger index. This is a far more rapid test, but it is not capable of the same degree of accuracy as a bridge test. To locate a leak on telegraph or telephone wires. First, (loop the lines; i.e., have them connected together at the far end. Measure their total resistance (L1+L2) by method 1. Secondly, connect as in fig. 4:

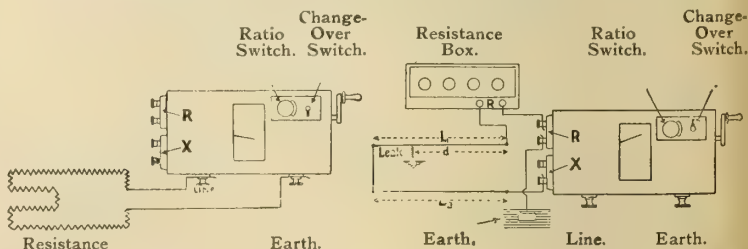


Fig. 3.

set the ratio switch to 1 and raise the resistance in the box till balance is obtained. The distance of the leak is given in ohms by the expression  $(L1+L2-R)$ ; so that knowing the ohms per mile of the line, the position of the leak is found. Those who are conversant with bridge testing work will find that most of the usual tests may be carried out by the bridge-megger. When testing the resistance of magnet coils and other circuits having self induction, a constant voltage is required in order to obtain steady readings of the index. In such cases the generator handle must be driven at any speed above the critical value at which the patent clutch slips. The machine then gives an absolutely constant electromotive force. The same precaution must be taken when measuring the resistance of circuits of considerable electrostatic capacity.

Fig. 4.



## Indirect Illumination

Probably no system of lighting is being more discussed at the present time than indirect illumination. Architects and fixture manufacturers have paid more attention to the artistic effect of the lighting arrangement than to the comfort and health of the public.

Since the "I-Comfort" system of indirect illumination was mentioned in the January "Electrical News" rapid advances have been made in the application of this system of illumination. The original cost of the system, which has heretofore been a serious drawback, has been minimized by the recently developed tungsten lamp. The "I-Comfort" system has also secured a reflective surface that gives upward reflection of light without perceptible loss. This is effected with a one-piece, silver plated, glass reflectors of correct scientific design for reflecting the rays of light at the right angle. It is made with spiral and vertical corrugations which break up the rays of light and eliminate streaks and shadows by throwing the illumination against the ceiling in an even flood. The

## An Enterprising Builders' Exchange

The Montreal Builders' Exchange recently took possession of their new premises in the Eastern Townships Bank Building, corner Victoria Square and St. James street, Montreal. In addition to enlarged quarters for its members, with the usual privileges, the directors have decided to set apart a roomy space to be sub-let to members who do not possess a down-town office. This should prove a great convenience to out-of-town firms who carry a Montreal agency. The electrical contractors, it is understood, are already in close relationship to the general Builders' Exchange.

A special new departure will consist of a department of permanent exhibits where it is proposed to exhibit to clients and prospective homesteaders, the latest materials and improvements in building construction.

## The Mechanics Supply Company

One of the oldest establishments in Canada handling a complete line of electrical appliances is to be found in the



122 Show Room—Mechanics Supply Co., Quebec.

light reflected in this manner approaches closely to daylight, and is especially soft and pleasant to the eye.

The essential conditions of the system are that the ceiling should be light in color; not necessarily white. The desirability of this system is being widely recognized and it is found not only in residences, but in hotels, bank buildings and clubs. "I-Comfort" systems are installed and highly thought of in the following buildings: Chicago Beach Hotel, dining-room; store of Alan Coe, optician, Chicago; Chickering Bros. piano factory, and the office of D. H. Burnham & Company, architects.

An especially satisfactory effect has been obtained by the use of this system in the new Maxine Elliott Theatre in New York by the architects, Messrs. Marshall & Fox. They have employed three especially designed chandeliers, each containing 24 inverted "I-Comfort" units to contain 100-watt tungsten lamps. The Southern Pacific are installing this system in their new hospital plant. "I-Comfort" inverted light is used in the 'Strollers' Club, New York; Kenwood Club, Home Insurance Company, Chicago Real Estate Company, North Shore Electric Company, and numerous other Chicago buildings.

Since it was first placed on the market, about the first of this year, over 1,500 units have been installed.

"old citie" of Quebec. The Mechanics' Supply Company, of which Mr. W. H. Wiggs is the proprietor, has a reputation of having the latest improvements in the mechanical and electrical arts. Their extensive showrooms are well worth a visit and contain samples of electroliers and art glassware gathered from the markets of Europe, Japan, the United States and Canada. They also handle an extensive line of telephone apparatus.

They have an extensive staff of employees, under the able management of Mr. Guy H. Simpson. Mr. Allan Wyce has charge of the electrical department.

Hudson's Bay & Pacific Railway Development Company, Limited. This company was registered recently, with a capital of £150,000 in £1 shares, to construct, equip and operate railways, tramways, telegraphs and telephonic systems in Canada and elsewhere. The provisional directors are: G. Bridgman, C. McFarlane, J. B. Helm, D. Lovell, J. H. Bailey, H. W. Dewar, and H. A. Fisher.

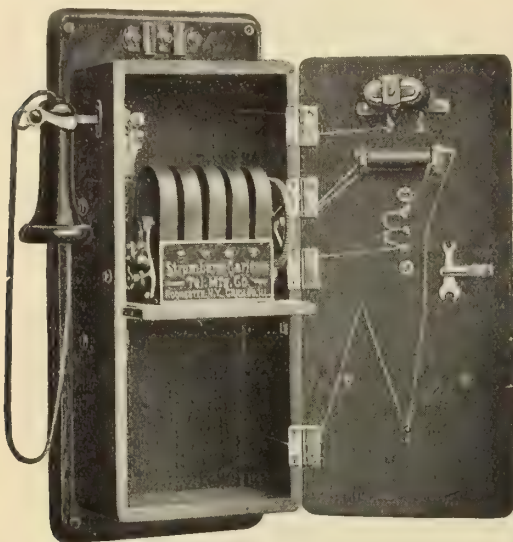
"Code" requirements governing the manufacture of insulated wire, are pointed out in a pamphlet issued by the Okonite Company, makers of insulated wires and cables, 253 Broadway, New York.



## An Improved Magneto Telephone

The No. 896 Compact Magneto Telephone, advertised elsewhere in this issue and manufactured by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N.Y., includes the latest development in magneto telephone construction.

The principal new features created with the No. 896 telephone consist of several detachable parts, which make it possible to ship each telephone in a packing box one-half ordinary size. The telephone box provides a removable generator and shelf, with a very accessible arrangement of the telephone parts. The ringer gongs are arranged so that they may be adjusted without opening the door of the telephone. The detachable features of the instrument are the switchhook,



Stromberg-Carlson Magneto Telephone.

transmitter and transmitter arm, writing shelf and hand generator. Each telephone provides for the addition at any time of a condenser or push button key. Further features and instructions for the operation of this entirely re-designed telephone are described in pamphlet No. 17, which is being distributed by the Ontario sales agent, Mr. Geo. J. Beattie, 109 Victoria street, Toronto.

## Results of Some Engine Tests

The Colonial Engineering Company, of Montreal, while operating in Canada only during the last two years, have installed a large number of Hornsby-Stockport suction gas engines. The actual results they have obtained with this engine establishes for it a permanent position in the realm of light and power.

A 200 horse-power municipal lighting plant installed in Chatham, Ont., was tested by K. L. Aitken, city electrical expert for Toronto, and showed the following results: Using anthracite pea coal the engines developed 100 h.p. while rated for 96 h.p.; using natural gas, 125 h.p. was obtained, or 19 per cent. more than guaranteed. A brake horse-power was guaranteed from one pound of anthracite coal, but in the test it was obtained from 92-100 of a pound. Mr. Aitken said in his report: "The engines show every evidence of proper design, good material and good workmanship." A 200 h.p. equipment was also installed in the new factory of Ames-Holden, Limited, Montreal, and careful readings taken from their switchboard for a period of one week. The following results were shown: The engines were guaranteed to produce power at \$19.25 per year (3,000 hours) per horse-power, at full load, or, if measured electrically at the switchboard, at one cent per kilowatt hour, including all operating costs, half time of engineer and seven per cent. on capital outlay to cover interest and maintenance. The engines met these guarantees with a horse power cost of only \$16.50, or 14 per cent. better than the guarantee, and a kilowatt cost of 94-100 of a cent—or 6 per cent. better than the guarantee.

In a 100 h.p. installment of the Empire Manufacturing Company, London, Ont., their total power cost was reduced from \$50 per annum per horse-power, to less than \$20, and very good results were obtained from similar installations for Frame & Hay Fence Company, Stratford, Ont.; Queen City

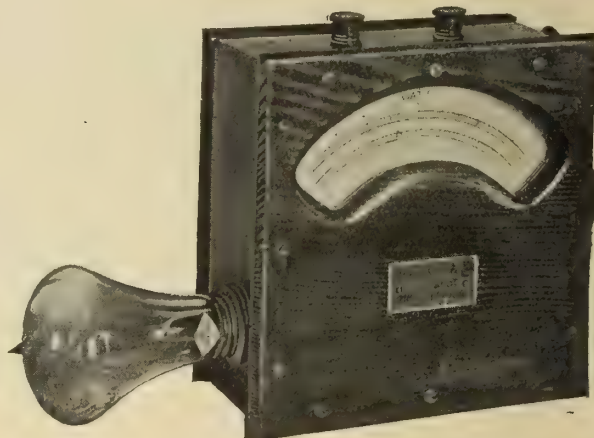
Printing Ink Company, Toronto, Ont.; Dominion Brewery, Toronto, Ont.; Vegreville Electric Light Company, Vegreville, Alta.; Essex Roller Mills, Essex, Ont.; and Megantic Electric Light Company, Lake Megantic, Que.

The average steam engine coal consumption will run from  $3\frac{1}{2}$  to 7 pounds of coal per h.p. hour, or  $3\frac{1}{2}$  to 7 times as much coal in order to produce a corresponding horse-power output. Therefore, as against steam engines, it is safe to say that the Hornsby-Stockport suction gas engine in units from 10 to 500 h.p. each, or of pressure producer type up to 2,000 h.p. each, can produce power, including all operating costs and fixed charges, for 50 per cent. less than the best steam engine practice and from 25 to 50 per cent. less than for current purchased from the outside.

## A New Volt-Wattmeter

To meet the demands for a volt-wattmeter for testing and demonstrating the popular tungsten and other high efficiency lamps now on the market, the well known house of Queen & Company has designed a new type of volt-wattmeter. It has also the advantage of allowing a user to see at a glance the exact wattage consumed by these lamps, and the cost of using same in comparison with the ordinary carbon filament lamps.

It is of a portable form, built as an ordinary portable volt-meter. There are two binding posts, and when connected in circuit the instrument reads as a voltmeter. Flush on the side is a lamp socket into which can be screwed an incandescent lamp or an attachment plug. The operation of screwing in a lamp actuates an interior switch in the instrument and when the lamp is properly based the instrument is reading as a watt-meter, directly in watts, there being two scales on same. The volt-meter feature is very much appreciated by all lamp salesmen, whose experience has shown them that it is best to get the exact voltage of each individual customer, as an error in a few volts either side in the ordinary carbon filament lamp causes serious fluctuations in



The Queen Volt-Wattmeter.

the candle power. The meter is of the dynamometer type and can be used on either alternating or direct current. These are made in several ranges and are being put on the market by Queen & Company, Philadelphia, Pa.

Annunciators, batteries, bells and house supplies are described in a neatly designed catalogue, just issued by the Canadian General Electric Company, Limited, Toronto.

Direct current generating sets—a combination of Alamo Engines and Westinghouse generators, are described in attractive circular 1,162, issued by the Canadian Westinghouse Company, Limited, Hamilton, Ont.

Circular 1,502, issued by the Westinghouse Electric & Manufacturing Company, contains much valuable information on alternating current distribution, covering transformers, lightning arresters, insulators, cross arms, etc. "Considerable space is devoted to underground and overhead construction applicable to congested and scattered districts. There is also given information on potential regulating systems. The circular contains 52 pages of information of value to any central station man or any other connected in any way with the distribution of power by alternating current lines.



# Electric Railway Department

## Modern Convertible Car in Experimental Operation

By M. POWERS, Master Car Builder Toronto Railway Co.

This car, as may be judged from the photographs, is of massive construction and is a convertible, pay-as-you-enter type. The body extends 30 feet, with an over-all length of 44 feet. The breadth over sides is 7 feet 11 inches, and the car was designed with the primary object of meeting the growing demand for a low-step car. Under ordinary circumstances, where your breadth is unlimited, the production of this type of car would perhaps not be a difficult matter. But in Toronto there is a devil strip only 3 feet 6 inches wide, and a track gauge of 4 feet 11 inches. This makes it necessary to build a car with a narrow body with the wheels radiating under

This is the largest, and at the same time lightest, platform in existence.

The deep step at the door which is used in winter service is reduced very considerably by the introduction of a steel mat at both ends. The mat is inserted in a wooden frame, which gives it an elevation of nearly two inches above the floor, and this frame gradually tapers off, preventing any stumbling. The front platform bumper is of the usual steel angle type and in the centre is placed a piece of the same material, standing up eight inches above the ordinary bumper. The purpose of this contrivance is, in the event of a collision occurring, it may come in contact with the bumper of another car which may be six inches higher, without the danger of running underneath the platform of the higher built car.

A novelty type sash opening cover is also used in this



View showing Steel Construction—Toronto Railway Company's New Car.

side sills, rendering the low-step car a difficult one to produce.

In this new type we have embodied a complete steel frame consisting of steel plate  $\frac{1}{2}$ -inch thick reinforced by steel angles. On these plates rest the cross ties or light steel channels on which the floor is carried. Over the trucks the floor is supported by a steel construction which allows the wheels to circle in close proximity to the floor.

The side posts in this car are what we term "flared in at the top," giving this car, at points where it would be likely to strike in passing, the ordinary breadth of cars built by the company. This plan allows us clearance to radiate the wheels between the sills at curves, resulting in a very much lower construction of car body and step.

The platforms are spacious and are carried by light side supports of the cantilever principle reinforced on edges by light angle steel. They are deep at a point directly under the car-end sill and at this point are supported in the ordinary way by heavy bolts through the sill. The centres of the platforms are supported by adjustable trusses which deliver the weight directly under the car sill, which is supported as above described. At this point the stress can be taken care of without trouble.

car. Unlike any dust cover, it supports the sash when up in position and when down it covers the opening, making at the same time a comfortable arm rest. This device allows the sash to run in a straight groove, which



Car, in open summer style, showing Low Steps.

cuts out to a large extent the disagreeable rattling so common to ordinary sashes.

As to the convertible features of this car, many improvements have been obtained rendering this type of



car still more perfect. The illustrations show the open car ready for summer traffic. It can readily be seen that with its thirteen seats, possibly a record number for an open car of this size, 78 people can be comfortably seated, while there is ample standing room between the seats and on the platform during rush hours.

In its winter garb the car presents a handsome appearance. It is finished in quarter-cut oak of first-class workmanship. The finish is perfectly plain, dispensing with the use of panels or moulding in as far as it was possible to permit. The upholstery is crimson plush on hair filled cushions. In the summer the cross seats

are fitted up with especially selected white ash, and the car has a decidedly cool and pleasing appearance. The system of lighting on it differs from other cars in that twice the amount of bulbs are used. There are three rows of lights—the usual one in the centre, supplemented by one over each of the advertising racks.

The motor used on this car is the ordinary General Electric type No. 80. The trucks are improved Curtis type. During its limited operation the car has proven satisfactory and will no doubt be standardized by the company.

## The Installation of a Railway Signal System

### Operation of the Simmen Device on the Mimico Division of the Toronto and York Radial Railway Company

In the January issue of the "Electrical News" we were able to furnish our readers with a brief outline of the Simmen Automatic Railway Signal System. Since then the system has been installed and put in daily operation on the Mimico division of the Toronto & York



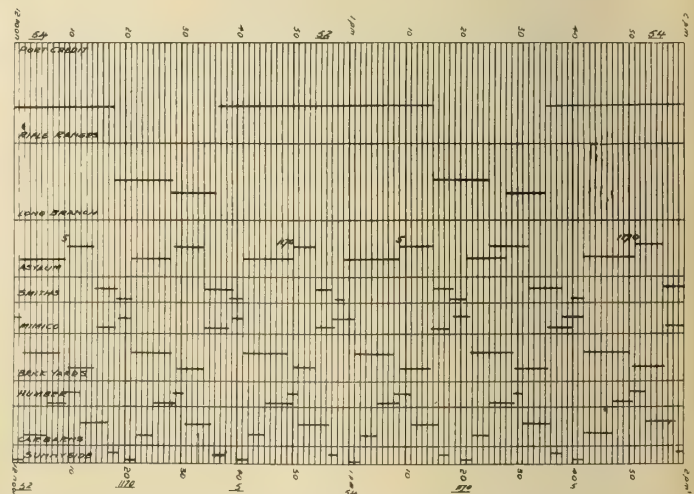
Motorman receiving orders over telephone in car. Signal Lights on face of 'phone box.

Radial Railway. A description of the mechanical details follows:

The operation of this system depends on one main and two local electrical circuits. The main circuit extends from the dispatcher's office the entire length of the line, passing in its course through a series of third rails. Of these there are two distant and two home rails for each block. This circuit is used for telephone and electrical signalling purposes. In the dispatcher's office is a local circuit, which, when energized from the main circuit operates a needle apparatus, by means of which a car's position and progress are clearly indicated. A local circuit is installed in each car, and when energized, it operates a signal box by the motorman's side and also affords telephonic connection with the main circuit and the dispatcher's office. The car signal circuit is connected with the main circuit through the third rail by contact shoes attached to the trucks. The signalling equipment in the motorman's compartment consists of a storage battery, a relay, a red lamp and a green lamp, an alarm bell and a telephone; the bell, the telephone and the lamps are all located in one portable

box, which can be carried from one end of the car to the other, according to the position of the motorman.

The apparatus in the dispatcher's office consists of: (1) a series of perforating needles, operated by clock work, (2) a chart divided longitudinally by time lines and latitudinally by block lines; the space between each of the latter lines represents one block of the system; the size of the spaces corresponds to the extent of the block that each represents. As the chart moves under the control of the clockwork mechanism, each space is or may be perforated by the needle which corresponds to that block. The smallest time space is the minute space and the chart moves the length of these spaces in exactly one minute. (3) A signal operating board from which by means of switches the dispatcher may energize the main circuit and consequently the third rails: each switch energizes one block of third rails, and the switches are arranged continuously along the board in the same order as the rails which they separately energize occur along the line. (4) A telephone through which by means of the third rails and the use of con-



Dispatchers Record Sheet—Simmen Automatic Railway Signal System—Mimico Division Toronto and York Radial Railway.

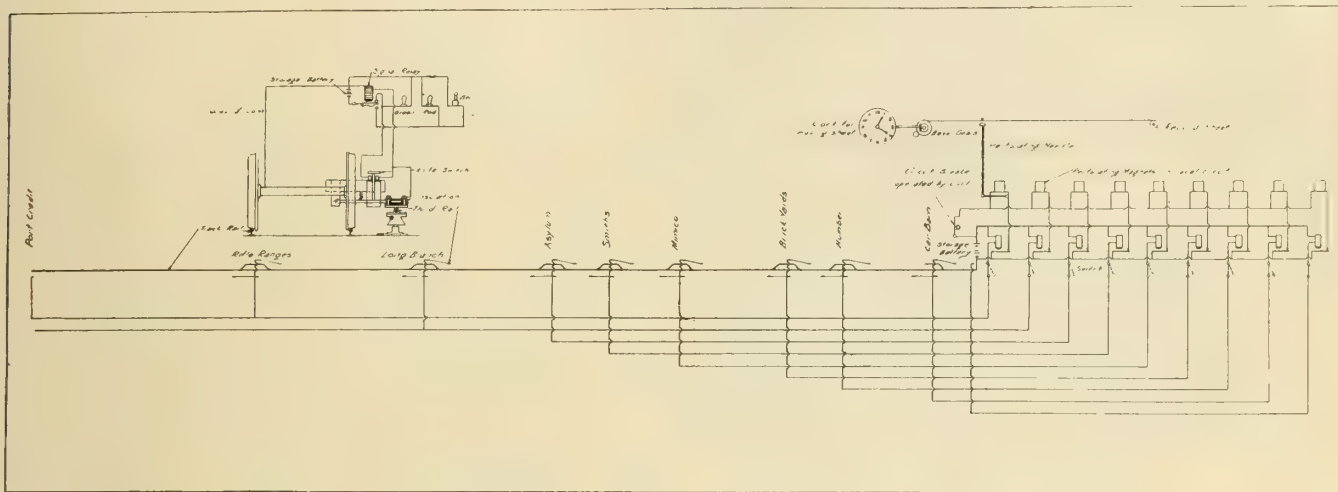
densers telephonic communication is maintained between the dispatcher and each and every car moving along the line.

On the chart mentioned above, the position and progress of each car is indicated in the following way: As a car enters the first block the perforating needle for that block begins to mark the sheet. Friction on the



record sheet is prevented by a circuit breaker in the local office circuit, which, operated by a make and break relay, vibrates the marking magnet. By a system of polarized relays the local circuit remains energized and a continuous record line is obtained so long as the car continues in the one block. As soon as the car enters the second block the perforating needle of the first block ceases to operate; but a perforated line remains, the length of which may be measured by the minute spaces;

circuit passes, is opened, and the influence of the car battery upon the local circuit is cut out. Under these conditions (i.e., with the local circuit not energized), the green light disappears, and a red light (danger signal) takes its place before the motorman's eyes. At the same time a bell attached to the signal box begins to ring, and continues to ring until the local circuit is again energized. When the contact shoe is touching the third rail the car circuit can only be energized from the



**Main Line Wire Diagram—Simmen Dispatching System—Mimico Division, Toronto and York Radial Railway.**

and which leaves an indisputable record of the time spent by the car on that block. When the car enters the second block the needle of that block begins, and so on until the line has been covered. So each car at the conclusion of its trip has left a continuous record of its journey, a record which may be consulted at any subsequent time, so that the dispatcher can tell in an instant the exact position of each and every car along the line and the

main battery in the dispatcher's office by the dispatcher throwing out the switch on his switchboard, which corresponds to the third rail which the contact shoe is touching. If the dispatcher does throw out this switch, the auxiliary circuit is energized, the red light does not appear, and the alarm bell does not ring, but the green light (the clear signal) flashes before the motorman's eyes. Thus when danger signals are given both the eye and ear of the motorman are assailed at once. If he misses the one, he can hardly fail to notice the other. The red light and the alarm bell can be discontinued only by the dispatcher throwing out the switch. The presence of another car in the next block operates automatically to lock the dispatcher's switch, so that if he should momentarily forget about the car in the next block his forgetfulness can bring no ill-effects in its train. It may be added that the signals are given no matter at what speed the car may be running.

It will be noticed that under normal conditions, and without energy being actively exercised, the danger signals are inevitably given. Should a break occur in the system at any time, danger signals are flashed in every car so soon as a third rail is touched by the contact shoes. Danger conditions, therefore, are positive; and safety conditions, negative.

When a car is on a third rail direct telephonic communication is possible between the dispatcher and the motorman. On this section of the Toronto & York Radial the regular schedule is a twenty-minute service, with fifteen-minute service during certain hours, and requires about 800 daily signal indications. The importance of accurate signalling and despatching on such a line is self-evident. By the use of this system both the human element, and the automatic machinery element, combine to render safety doubly sure. So that if there is danger in the block on which he is about to enter, the motorman sees the red light of danger, hears the alarm bell, and receives the verbal message of the dispatcher.

This system is the invention of Mr. P. J. Simmen, an American engineer. The Toronto & York Radial Rail-



**Shoe Making Contact on third rail—Simmen Automatic Railway Signal System—Mimico Division, Toronto and York Radial Railway.**

exact instant in which each car enters or leaves a block.

The signalling system in each car is as follows: The two signal lamps are located on two auxiliary circuits. When the contact shoe is not on the third rail the local relay is energized by a current from the car battery and a green light (clear signal) is displayed before the motorman's eyes. As soon as the contact shoe touches a third rail, the knife switch, through which the main



way is the first Canadian road to adopt it on a portion of its road. The company purposes at a later date to install an automatic stopping device, to work in conjunction with this system in such a way that should a danger signal be given and the motorman or engineer fail to recognize it and to reduce his train speed, the automatic stop will apply the air brakes according to the train speed at the time the danger signal is given.



howing Despatcher at Work—Sunnyside Office, Mimico Division, Toronto and York Radial Railway.

By the use of this automatic stop it is possible for a train's speed to be reduced to any number of miles per hour that the railroad predetermines, over any portion of the road that they wish. It also prevents trains from taking curves, grades and trestle work at excessive speed, and by the use of the track circuit will display broken rail conditions. This system can be used as an auxiliary to any other fixed type of signals now in use without interference on either side. A very low cost of maintenance is claimed for this system.

### Tramways for Calgary

Calgary, Alta., will soon have a modern street car system operated under municipal control. The work on the twelve miles of track is being rapidly pushed forward and the system will probably be in operation before the end of the year. Five miles will be double-tracked. In the track construction the Ohio Brass Company's all-wire, solid terminal bonds will be used except on a short stretch of track where soldered bonds will be installed. 80-pound and 60-pound Lorain sections will also be employed. On the main streets steel poles will be used and cedar poles for the rest of the system. The feeders will be of aluminum.

The municipal lighting plant is being enlarged and will supply the power for the car system. The equipment being added to look after this load consists of one Robb-Armstrong high-speed, 750 h.p. engine connected to a 500 k.w. Allis-Chalmers-Bullock generator. An auxiliary plant will consist of a 300 k.w. Allis-Chalmers-Bullock synchronous motor and a 1,000 h.p. Babcock & Wilcox water tube boiler fitted with superheaters and the induced draft system. Twelve semi-convertible pay-as-you-enter cars now on order with the Pay-as-You-Enter Car Corporation, and probably four more, will be required. The Coleman Fare Box Company, of Tottenham, Ont., will supply the fare boxes. A car house to accommodate 16 cars is in course of erection. The estimated cost of this tramway system is \$450,000, and it will be under the control of a paid commission of three, with the mayor as chairman. Mr. Thomas Mc-

Cauley, of Port Arthur, Ont., will be the superintendent for the company.

### Stuart Howland Company's New Building

The Stuart-Howland Company, of Boston, have recently moved into their new store and offices, Nos. 1, 2 and 3 Winthrop Square, and 12 to 36 Otis street. This building is located in the heart of the busiest business section of Boston. It contains about 13,000 square feet on each floor, and has been fitted out in the most up-to-date manner for storing and handling electrical merchandise at the lowest possible cost. It has a street frontage of over 325 feet, and as the entire front walls are of plate glass, except the stone piers, which are about two feet square, the entire floor area is unusually well lighted.

The general accounting and private offices occupy the entire Otis street side of the ground floor, while the sales offices take up the Winthrop Square side, running back about fifty feet from the street. All of these offices are especially well lighted and attractive, the whole layout presenting a spectacle of unusual activity.

The Stuart-Howland Company started in business only nine years ago, and its growth has been rapid and constant. Even last year, which was so extremely dull in this line of business throughout the United States, its sales ran considerably ahead of any previous year. This growth has not been due to any new methods, but rather to energy, fair dealing and prompt service. Its management is quite optimistic of the early return of business prosperity and in proof of this has recently added six new men to its already large force of salesmen on the road. It has many selling agencies where manufacturers market their entire product through this company. Among them is the Standard Magnet Wire Company,



Stuart-Howland Company.

of Claremont, N.S., whose product is well and favorably known throughout the United States and Canada.

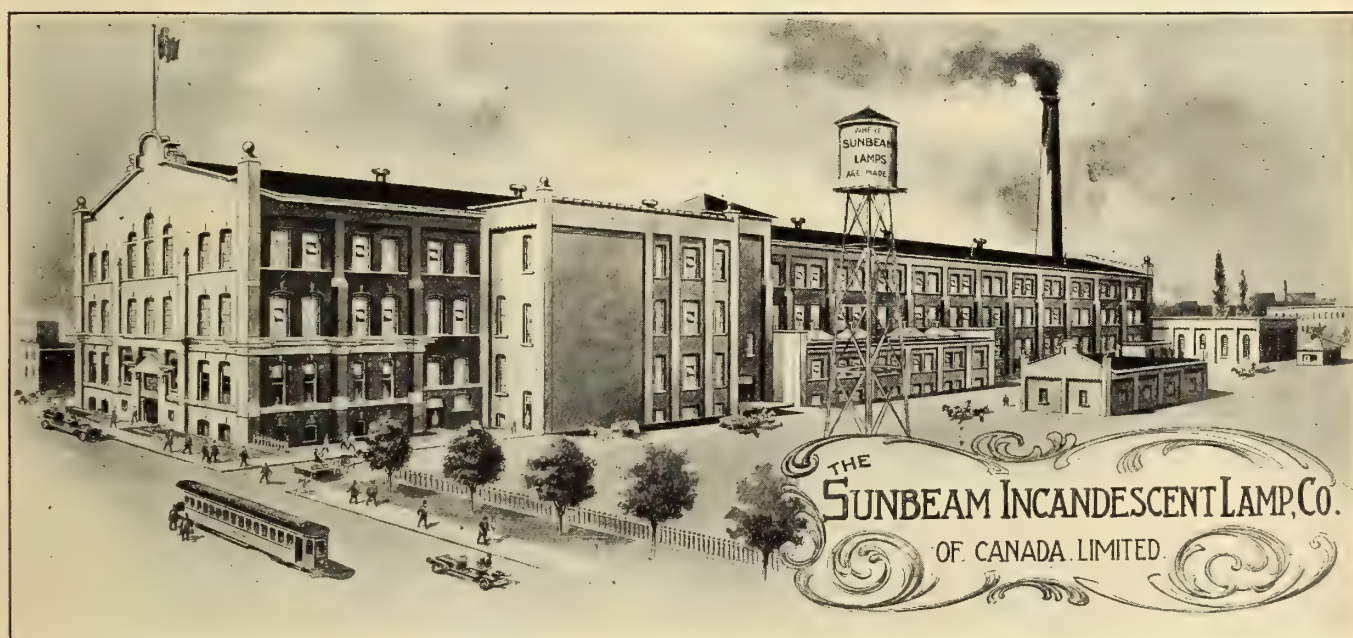
### The Samuel Russell & Company

On another page will be found the advertisement of Samuel Russell & Company, Limited, Walsall, England. This firm ranks with the oldest and best known in the United Kingdom and have had seventy years experience in the manufacture of all styles of crucible castings. The gradual expansion of the company necessitated operation under three separate roofs, until two years ago, when a new and modernly equipped works was erected. Rapid execution of all orders received was thus made possible, and regular weekly shipments can be made after the first fortnight, in any quantity. The satisfactory introduction of their products by some of the well-known English firms should be a sufficient recommendation to those requiring castings of great tensile strength and high finish.



The Finest Equipped  
**TUNGSTEN  
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**Main Office:**

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Northwestern Office and Warehouse : **Winnipeg**

# TELEPHONE TOPICS

## Some Problems in the Telephone Transmitter Design

By Wm. A. Taylor, M. E.

To the average purchaser the transmitter on the telephone is no mystery and there should be no excuse for it giving any trouble. To the designer the transmitter is a constant source of worry. So often do new designs fail that very frequently changes on old apparatus are not undertaken simply because of the doubt of the success of anything new. Many manufacturers have sent out by the thousand new transmitters which have made fine records in the laboratory only to have them returned. The question then is, why cannot transmitter design be reduced to an exact science. It can be, and the reason that it has been such a difficulty is that it has not been studied properly. The average designer in the past has not been governed by a proper knowledge of what is necessary for the proper working of the instrument. Either he allows a hobby to get the better of him, or he works to secure something different from existing designs merely to show originality. Many designs are developed merely to evade patent claims. The above reasons, taken with the fact that the engineer frequently has to do work without proper appliances, explains the reason for failures. Several years ago the head of one of the largest telephone factories in the United States openly declared that he could make an expert telephone engineer out of a dry goods clerk, inside of three months.

To the user a telephone transmitter consists of some granulated carbon placed between two carbon plates. One of the plates is movable and will vibrate with a diaphragm against which the voice waves impinge. That is all true, but the details of the construction are the cause of all the trouble. It is assumed that the reader is familiar with the common forms of the transmitter and therefore this article will deal only with some of the details that have caused trouble.

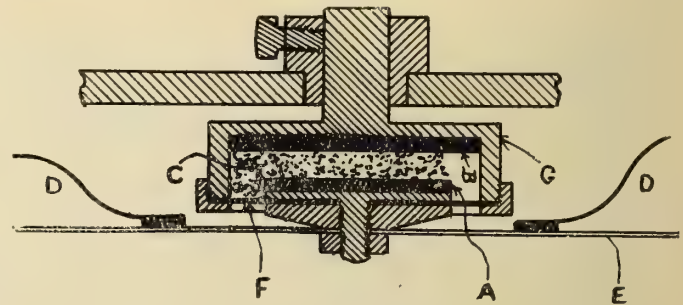
In order that a transmitter may talk properly it must have a proper amount of current. The more the current up to a certain limit the louder it will talk. If too much current is taken, the expense of operating will be too great, and therefore no more current should be taken than is required to talk successfully over the longest lines of the system. This amount of current varies from .10 ampere to .15 ampere in the average instruments, though some take as low as .08 amperes and others of poor design as high as .75 ampere. The lowest figure given is enough for talking over moderate distances and should give good satisfaction for general work. For the most severe conditions .15 ampere is about the best current. The amounts of current given above are for the local battery transmitters. The transmitters used on central energy systems must work efficiently on much less current than those for local battery, for all current must be supplied over the line. The central energy transmitter seldom gets over .10 ampere, even on a line of zero resistance, and more often it has to work efficiently on .05 ampere.

A transmitter, to give the best results, is the one that will have the greatest variation in its resistance. The current during operation must not break, but change in quantity exactly in proportion to the change in pressure between the carbon particles and the electrodes.

There must be no changes in pressure or resistance except that which is caused by the voice waves striking the diaphragm.

One of the worst troubles that prevent the proper variation in resistance is the packing of the granular carbon. This packing may come from several causes. The figure shows a diagram of the working parts of a typical long distance transmitter. A and B are the movable and the fixed electrodes respectively. Between the two electrodes is a quantity of granular carbon C. Normally the pressure of this granular carbon should be exceedingly slight, for any material pressure will entirely kill the variability of the transmitter. If the chamber G is so full that a pressure is caused, the action of the instrument may be very bad; the degree of poorness depending upon how tightly the carbon is packed. Ordinarily the chamber is filled about three-fourths to five-sixths full.

Too great size to the carbon chamber is to be avoided because the weight of the granular carbon will cause packing at the bottom of the chamber. This was a common fault with the older form of transmitters. When loosened up this form talked very loudly, but the waste



Telephone Transmitter.

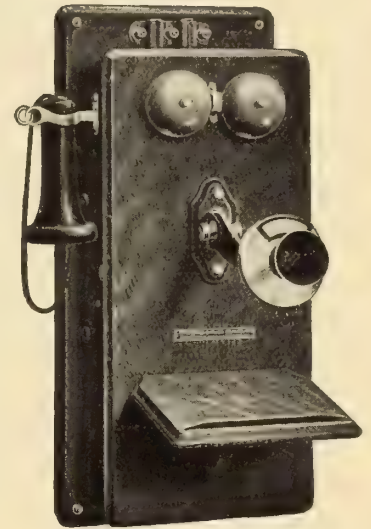
of current at the bottom of the chamber was great. There was no variation in the resistance of the chamber at the bottom and the current flowed constantly at that point, causing no effect at all. The only variable portion was at the top of the chamber. This is the type of transmitter that required from .50 to .75 ampere for successful work. Only a small percentage of the current was effective. Some of the old forms had a carbon chamber fully two inches in diameter. The modern transmitter chamber is never more than three-fourths of an inch inside diameter, and the majority are from nine-sixteenths to five-eighths of an inch. With chambers that small there can be no trouble from too great weight of the granular carbon.

With the decrease in size of the electrodes, there is a corresponding increase in the normal resistance, as will naturally be expected. With large electrodes it was the custom to place them an eighth of an inch and more apart. With the smaller sizes the spacing is sometimes as low as 3-64ths of an inch, but mostly one-sixteenth of an inch. With these close spacings great care must be exercised in order to have all the particles of carbon of one size. Should there be any that are extra large they might wedge between the two electrodes and cause a short circuit. With all other dimensions the same, the closer the two electrodes the lower the resistance. The bringing of the electrodes closer together is not always sufficient to bring the resistance of the trans-

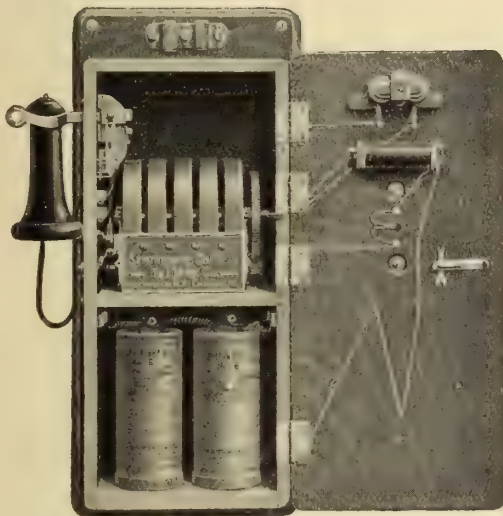


## Our Improved Compact Magneto Telephone Many Economical Features—More For Your Money

Before you decide on any Magneto Telephone for any purpose think what that telephone must do. Consider service under severe climatic conditions and heavily loaded lines. Think of the rough usage and reliability expected. Of the maintenance and economy. Of all the efficiency and volume of transmission, in times of actual use, that it must provide. Then examine our No. 896 Compact Type Magneto Telephone. Recently placed on the market to provide something better for discriminating Independent telephone men apace with modern telephone practice.



No. 896 Compact Type Magneto Telephone 5-Bar Generator 1600 - Ohm Ringer.



The only Magneto Telephone having a Detachable Transmitter Arm, Writing Shelf and Switchhook besides a Removeable Generator and Shelf.

### SEND FOR OUR PAMPHLET No. 17

¶ This advanced circular tells about all the new features of No. 896 Compact Type Magneto Telephone.

¶ It tells what we have put into our No. 896 Telephone that others lack. It describes and thoroughly illustrates the improvements and the reason why a telephone like our No. 896 saves you money.

¶ It tells you that there are two for one reasons why every part of a "Stromberg-Carlson" telephone is superior.

¶ You will realize that progress has been made in the interest of the telephone user and improvements in design accomplished—all provided with no extra first cost to you—and no after cost necessary.

¶ Write to-day and let us serve you promptly.

# STROMBERG-CARLSON TEL. MFG. CO.

Ontario Sales Agent

**GEO. J. BEATTIE, Esq., No. 109 Victoria St., TORONTO**



mitter down low enough. Specially low resistance granular carbon must be used in order to get the best results for the longest distances with local battery transmitters.

When the electrodes and carbon chambers were reduced in size the trouble from packing was not by any means cured, but there yet remained the worst packing trouble of all. This was the packing caused by heat expansion. As soon as current begins to flow heat is generated. This heat, even though but small in quantity, was the cause of the worst form of packing. Referring again to the diagram, the electrode A is mounted upon a flexible auxiliary diaphragm F; it is also attached to the main diaphragm E. If for any reason F should not be flat, but should be buckled slightly inward, the expansion from the heat would tend to move electrode A toward B. This action would cause the granular carbon to pack. The movement of the electrode probably does not amount to a ten thousandth part of an inch, but it is all that is necessary to cause the transmitter to fail. If the diaphragm F is normally buckled outward a trifle, the heat causes the two electrodes to separate and any tendency to pack is avoided. If the diaphragm F lies perfectly flat, and no precautions are taken to prevent the electrodes from getting closer, there is an equal tendency on the part of the electrode A to approach or separate from B. A few makers have purposely caused F to buckle outward with more or less good results. If F should be normally buckled outward the transmitter will work beautifully after it is warmed up, but after the current is cut off and contraction takes place the carbon becomes packed. The transmitter then remains dead for a short time after it is again used, or until the chamber is warmed up again.

The diaphragm F is made flat by most makers, but heavy damping springs DD are placed against the main diaphragm p, at the back. Any expansion of this main diaphragm, due to the heat of the current or the breath, causes it to buckle toward the speaker and thus it separates A from B.

Poor articulation has been a drawback to the loud speaking transmitter. This trouble nearly always comes from allowing too free motion to the main diaphragm. One of the uses of the springs DD is to prevent too much movement to E, and the prevention of sub-vibrations. As soon as the sound wave ceases the vibration should be stopped, and as soon as the wave changes the diaphragm should instantly respond. This quick action can only be secured where the moving parts are as light as possible, therefore the diaphragm and the parts mounted upon it should be as nearly as possible without weight, or inertia. Generally the damping springs do not add quite stiffness enough to cut out supersensitiveness, but by making the auxiliary diaphragm F quite stiff, the desired quality is secured.

The carbon electrodes themselves are responsible for a great deal of transmitter trouble. To get the best of results they must be of the most pure material, exceedingly hard, homogeneous, and carefully polished. It is not always easy to get such carbon, and for that reason there has been a tendency to use other materials, such as gold, silver and platinum. Very good results may be secured from these metals, especially from the gold and platinum. To get the same results from the metal electrodes the dimensions of the electrodes must be different from those of the carbon or the distance between them must be less. It is strange that a chamber having metal electrodes has a resistance of about 25 per cent. greater than one having carbon electrodes, with the same dimensions throughout. By reducing the distance between the two electrodes and using granular carbon of extra

low resistance it is possible to get the best of results. Where precious metal is used for electrodes it is common to use it electroplated on some inferior metal. That produces good results only when it is of sufficient thickness. If very thin, the granular carbon will sooner or later wear it away and expose the base metal, which will corrode and cause trouble.

Above all things, accuracy is essential. It makes no difference how carefully the designer has been, it will not avail if the parts are not correctly made. The parts of the variable resistance chamber must be made as nearly exactly right as it is possible to make them.

### Canadian Telephone Trade is Active

The Canadian Railway Commission recently issued an edict granting independent telephone companies the right to place instruments in all railway stations. This ruling was given out to cover the Sherbrooke case, but it has been made general. At the present time the Bell Company hold exclusive rights to this privilege on many of the railway lines throughout Canada.

Duty was recently demanded at Montreal at the rates of 30 per cent. and 35 per cent. on certain finished integral parts of telephones which previously had been admitted as electrical apparatus, not otherwise specified. The Customs Department has decided that the former practice will be adhered to, making the rate under the general tariff 27½ per cent.

### Telephone Contracts

Mr. George J. Beattie, Canadian representative of the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N.Y., with office and warehouse at 109 Victoria street, Toronto, Ont., has been actively representing that company on the road this spring, and recently closed the following contracts: 400 line self-restoring drop switchboard and telephones for the town of Kenora, Ont.; switchboard and telephone equipment for Stouffville-Bethesda Telephone Company, Stouffville, Ont.; Fingal Telephone Company, Limited, Fingal, Ont.; J. Marsh, Coldstream, Ont.; Alberta Railway & Irrigation Company, Lethbridge, Alta.; Dominion Power & Transmission Company, Hamilton, Ont.; 100 central energy telephones for the corporation of Fort William, Ont.

Mr. Beattie also reports the sale of the Stromberg-Carlson Company's new key type intercommunicating telephone system to the following: 20-station system, Toronto Public Library; Kaufman Rubber Company, Berlin, Ont.; 10-station system, Mail Job Printing Company, Toronto, Ont., and six additions of the 30-station type to the system installed at the Bank of Nova Scotia, Toronto.

The Bell Company have made extensive progress in rural telephone work. In Ontario alone they have more than 262 rural connections.

In West Toronto the Bell Company are erecting a new exchange on Peel street, opposite Annette street, that will supplant the present inadequate building. The new building will cost \$15,000 and is to be handsomely fitted throughout.

Montreal now has a new Bell exchange at the corner of St. Joseph Boulevard and Cadieux streets. The building is to be known as the "St. Louis," is fireproof throughout, and will have accommodation for ten thousand subscribers when it is ready for service, early in July.



# Telephones and Switchboards

We can supply anything in the way of Telephones or Switchboards,—either manual or automatic, either for the city, town, village or country lines.

We have the only Canadian factory actually manufacturing telephone equipment in the Dominion that is not connected with or controlled by the Bell Telephone Company.

## Canadian Independent Telephones

have made an excellent reputation with hundreds of rural telephone companies for satisfactory service, up-to-date design and good appearance. Scores of companies using other makes have changed to the Canadian Independent telephone after one practical test.

Our Engineers will give full information regarding the construction of rural lines or telephone matters generally. Ask for our No. 2 Bulletin if you are interested in rural telephone lines.

## Canadian Automatic Telephones

Our automatic telephone (Canadian Machine Telephone Co.) will be seen up-to-date in our Brantford Exchange which is opening for business in June. It is the ideal telephone service for town and city and the Brantford plant is as complete and up-to-date as any telephone plant on the continent.

Last year we installed an automatic plant in connection with the Government's Exchange in the City of Lyons, France and it has made a remarkable record. The automatic section of the Government's Exchange in Lyons, were the only telephones giving service during the recent strike there. The Canadian Machine Automatic Telephone is Canadian invented and Canadian made.

## Construction Supplies

We carry a full line of telephone construction supplies of all kinds and can make prompt shipment from stock at all times.

FACTORY AND OFFICE, 26 DUNCAN STREET

T O R O N T O

Canadian Independent Telephone Company

Limited

# Current News and Notes

## **Altona, Ont.**

The Central Telephone Company has been incorporated with a capital of \$40,000. J. Underhill is interested.

## **Apsley, Ont.**

The Apsley Telephone Company has been incorporated with a capital of \$10,000 by D. Brown, Z. Tucker, of Apsley, and D. Davidson, of Peterborough, Ont.

## **Abernethy, Sask.**

The Foster Rural Telephone Company has been incorporated with a capital of \$5,000.

## **Brandon, Man.**

The Municipal Light, Heat & Power Company has been incorporated with a capital of \$50,000. The incorporators are: G. Edgar Knechtel and Violet Knechtel, both of Winnipeg, Man.; M. B. Jackson and W. A. Thompson, Hamiota, Man., and W. C. Fraser, of Hamiota.

## **Berlin, Ont.**

The ratepayers of this town last week carried two money by-laws, which were defeated at the municipal elections. One by-law was to raise \$40,000 to purchase the necessary machinery for the distribution of Niagara power, and the other to raise \$8,000 for new gas mains.

## **Buckingham, Que.**

Plans are being prepared for the extension of an electric car line between Masson and Buckingham.

## **Broomhill, Man.**

The municipality of Albert has voted in favor of a municipal telephone system. For further information address W. Kilkinny, Broomhill, Man.

## **Brantford, Ont.**

The Machine Telephone Company have poles along the Burford road for about five miles outside the city. They will shortly have the phones ready for use.

The most important piece of work to be undertaken in connection with the reconstruction of the street railway is the relaying of the Colborne and Market street lines. According to the contract with the city this work must be done within three and four months respectively from May 1. The reconstruction of the line on other streets, and the construction of some additional lines, has to be completed within two years. When the lines are reconstructed in accordance with the agreement, there will be sixteen miles of electric railways in the city.

## **Barrie, Ont.**

The commissioners recently reduced the lighting rates by 5 per cent. The minimum consumption per year was also reduced from \$12 to \$10.

## **Creston, B.C.**

The Goat River Power Company have secured permission for the construction of a 10-mile tramway to Duck Creek.

## **Cobourg, Ont.**

The Cobourg, Port Hope & Havelock Electric Railway Company has been granted a charter for a line which will run across Northumberland County to Warkworth and Campbellford and on to Havelock, with branches to Blairton and to the Marmora mining district, and other

branches from a point near Warkworth to Roseneath and Hastings. The company includes Col. H. A. Ward, K.C., of Port Hope, secretary of the company; W. J. Crossen, Cobourg; H. T. Bush, Port Hope, E. S. Huycke, K.C., Port Hope, and Reeve Jos. Knox, of Havelock.

The Town Council has granted the request of the Provincial Steel Company to construct a line of railway from its plant to the lake front. The Cobourg, Port Hope and Havelock Electric Railway Companies have also been granted franchises to enter the town.

## **Collingwood, Ont.**

A syndicate headed by J. P. Charlebois has been formed to develop water power on the Osler property, which has been purchased for this purpose. The total expenditure involves \$100,000.

## **Chippewa, Ont.**

The Council has granted the Welland County Telephone Company a franchise to extend its telephone lines to this village.

## **Cranbrook, B.C.**

The ratepayers recently endorsed a by-law transferring the rights of the Electric Light Company to the Kootenay Telephone Lines, Limited. The new company proposes to connect with the government lines in Alberta and with Spokane and other Pacific coast cities.

## **Carlsbad Springs, Ont.**

The Gloucester Township Telephone Association, a newly formed organization, has been granted permission to erect a line from Carlsbad Springs along the Russel road. A. Childs, of Carlsbad Springs, is president, and J. O. Hodgson, secretary.

## **Calgary, Alta.**

The Province of Alberta has received petitions for the construction of approximately 3,000 miles of telephone line during the present year and plans have been accepted for some 900 miles of line. In addition to the rural lines a trunk system will be built from Medicine Hat to Taber, a distance of 90 miles, and an additional wire will be strung on the circuit connecting Calgary, Edmonton and Fort Saskatchewan.

## **Fernie, B.C.**

Tenders were received to May 13th for an electric light and power system, erection of power house and removal of power plant from Coal Creek.

## **Govan, Sask.**

The organization of the Govan Rural Telephone Company has been completed, and tenders for the construction of a telephone system will be called for soon.

## **Galt, Ont.**

The ratepayers will probably be again asked to vote on a by-law for hydro-electric power.

## **Glencoe, Ont.**

The town is installing a 100 horse power Hornsby-Stockport suction gas engine unit for street and domestic lighting.

## **Hamilton, Ont.**

The Street Railway will shortly commence the reconstruction of its James street tracks.

The city has accepted the offer of the Hamilton Electric Light & Power Company

to furnish electricity for the illumination of Gore Park and extension from May 24 until September 30 for \$550.

## **Heward, Sask.**

Mr. John Stuart is interested in the new telephone company being organized at this place, called the Heward Rural Telephone Company.

## **Kamloops, B.C.**

The Coteau Power Company, which is developing power at Shuswap Falls, twenty-six miles east of Vernon, is negotiating with the City Council with a view to providing the city with a power and lighting service. There is stated to be considerable capital behind the company. It is said that the present policy is to develop 8,000 horse power in units of 1,000 each. W. R. Morris is the company's representative.

## **Lindsay, Ont.**

A recent test of a new electric pump installed in the waterworks proved very satisfactory.

## **Lachine, Que.**

The panelboards for St. Ann's Convent, at Lachine, Que., are being furnished by The Hill Electric Switch & Manufacturing Company, Limited. The wiring is being done by Messrs. Picard & Lalonde, of Montreal.

## **Lethbridge, Alta.**

The provincial government will start work immediately on the new telephone exchange here. A two storey brick building will be erected and all modern conveniences installed.

## **London, Ont.**

Tenders will shortly be called for the supply of wires, insulators, cross-arms, poles, etc., for the distribution system in connection with the Hydro-Electric Power Commission project. For further information address E. I. Sifton, city engineer.

The London Electric Company have offered to sell their complete equipment to the city for \$400,000.

It is announced that the London Street Railway Company expects to use additional power for the coming summer season, but it has not yet been decided as to what kind of electrical equipment will be installed. C. B. King, manager.

## **Miniota, Man.**

Preparations are being made for the construction of a rural telephone system. For further information address Reeve Gerard, Minota.

## **Moncton, N.B.**

J. B. Weller, C.E., superintendent of the Welland canal, and one of the promoters of the Fundy Tidal Power Company bill, now before parliament, has outlined the scheme for the development of power from the Bay of Fundy. The proposed dam is to be constructed at Hopewell Cape and is to be 40 feet high. Surveys will be made this summer. It is hoped to have plans completed by the fall.

## **Midale, Sask.**

A rural telephone system will probably be in operation here in the near future. Meetings are being arranged at which the matter will be discussed and arrangements made for beginning work.

The Merchants' Light & Power Company have applied to the Dominion Legis-



lature for a charter to supply electricity and gas within a specified territory in Montreal for lamps and motors. The company is to be capitalized at \$1,500,000 with power to increase it to \$3,000,000. The petitioners for incorporation are: Odilion Lemire, J. B. Letendre, B. Mercier, A. T. Vallieres, O. Lecompte, L. J. Tarte, J. Durand, R. A. Brossard and others.

#### Montreal, Que.

For the first four months of the year the Montreal Street Railway earnings were \$1,158,717, an increase of \$53,324. For the same period the Toronto Railway Company took in \$1,158,426, an increase of \$82,920 over 1908's figures for the same time.

The City Council are considering the advisability of constructing and operating a system of underground conduits for all electric wires except trolleys. A rental will be charged to the companies whose wires will be buried.

The Saraguay Electric Light Company have offered to supply the city with street lamps at \$70 per lamp.

The project of the electrification of the G. T. P., from Montreal to Moncton, 460 miles, seems to be under serious consideration. The power which would be utilized would be the Grand Falls on the St. John river, about half way between the two points. This, in connection with the lakes, would give 150,000 horse power.

The Canadian Pacific Railway telegraphs will construct a metallic circuit from White River to Fort William, making 502 miles of copper wire for train despatching. They will likewise string two copper wires between Winnipeg and Brandon, 133 miles; and also from Swift Current to Medicine Hat, 147 miles; from Winnipeg to Field, B. C., 971 miles, which is to be used for telegraph purposes, while a copper wire will be erected from Calgary to Cranbrook, 276 miles, this also being for commercial purposes, and making 2,500 miles of new copper wire to be put up by the company during the coming season. They are also engaged in rebuilding over 600 miles of pole lines in different parts of the system, besides which, several hundred miles of new wire will be spread over the new western provinces.

G. F. Greenwood, of Montreal, is president of the Mexican Northern Electric Company, of Canada, which proposes constructing an electric power plant on the Rio Conchas, a short distance from Parral, to cost about \$5,000,000. The initial capacity of the proposed plant will be about 15,000 h.p., and the power generated there will be used for mining and irrigation purposes.

Active operations will be started soon on the Montreal & Southern Counties Railway. E. A. Mumford, Secretary-Treasurer of the Montreal & St. Lambert Terminals Development Company, has announced that they will award contracts soon for all the electrical apparatus necessary for an electrical tramway company, which is to be put into operation between McGill street, and the several communities on the South Shore. The tubular steel poles required for this electrical installation have been purchased, together with all the necessary appliances on the bridge and elsewhere. It is reported that the company will utilize the south roadway on the Victoria Jubilee bridge for laying its track. It is possible that this roadway may be widened in the future, so as to permit of a double track, but the requirements of the coming season will be met by laying a single track, supplemented for traffic purposes by two switches, until

the company's system is extended to Longueuil, Chambly and other points embraced in the plan of construction. It is announced that operations will shortly be begun on the company's sub-station and car barns at St. Lambert, Que.

The Dominion Light, Heat & Power Company have been granted a franchise to operate in Montreal free from municipal control, except in Westmount. They will not be allowed to string wires along roofs of private houses.

Lamontagne Limited, of Montreal, have just installed two 50 horse power Hornsby-Stockport suction gas units, driving two direct current dynamos for lighting and power.

The proposed new power plant at McGill University, which is to be installed to furnish steam heat and electric power to all the buildings, is to cost about \$150,000. The architect for the building is Prof. Nobbs. The dimensions of the building are 80 by 116 feet, the boiler room 80 by 48 feet, and the engine room 42 by 60 feet. The chimney will be 8 feet in diameter by 160 feet in height, and will be constructed by H. R. Henricke, of New York.

Tenders addressed to Charles Brandeis, consulting engineer, Montreal, were received until May 12th for the supply of 1,000 horse power steam turbine generator sets, for the Saraguay Electric & Water Company of Montreal.

#### New Hamburg, Ont.

The Metropolitan Railway Company, it is reported, contemplate constructing a railway which will extend from Stratford to Guelph.

The town have decided to purchase \$20,000 worth of preferred stock in the proposed People's Railway Company. The Metropolitan Railway Company may build the line which will run from Stratford to Guelph. The company's capitalization is \$1,000,000, and other municipalities along the line will be asked to purchase stock in the enterprise.

#### Niagara Falls, Ont.

The Ontario Railway & Municipal Board has ruled that the International Railway shall reduce the fare on its line from the town of Niagara Falls, Ont., to Niagara Falls, N.Y., from 10 cents to 5 cents.

#### North Battleford, Sask.

The proposition to issue \$75,000 in bonds, the proceeds to be used for the installation of an electric light plant, water works and sewer system, will be submitted to the ratepayers.

Willis Chipman, consulting engineer, 103 Bay street, Toronto, has been retained to prepare plans for a municipal electric lighting system.

It is stated that Messrs. Smith, Snyder and McLeay, of Gravenhurst, Waterloo and Watford, have made propositions to the town with a view to getting a franchise for the installation of a lighting system.

#### Nelson, B.C.

It is proposed to build a telephone line from Nelson to Salmo, permission having been obtained from the Great Northern Railway for use of its telephone poles for \$5 per pole per annum.

The Cranbrook Telephone Company, which bought out the Fernie telephone system from the Crow's Nest Pass Coal Company last November, has decided to construct a line from Fernie to Lethbridge, connecting there with the Alberta Government system. In addition to this extension is the project of the same company to con-

struct a line to Port Hill, Wash., and so obtain connection with Spokane.

#### Newtonville, Ont.

Another independent telephone line to connect Orono and Newtonville has been organized in Durham county. The officers are: President, W. H. Reid; vice-president, Andrew Sharpe; secretary-treasurer, Moses Cowan; directors, H. W. Renwick, W. N. Buckley, H. Millson, R. Ferguson and John Turner.

#### Oxbow, Sask.

The Oxbow Telephone & Lighting Company have decided to build rural lines to Auburton, Arthur, Boscurvis and Glen Ewen. For further information, address J. P. Tripp.

The South Lambton Telephone Company are preparing to extend their lines to Thornyhurst and Bickford.

#### Ottawa, Ont.

J. D. Fraser, secretary of the street railway company, states that the company will proceed at an early date with the construction of the newly authorized loop lines.

The Western Canada Power Company, capitalized at \$5,000,000, has been incorporated by Messrs. J. W. Burrell, E. P. Wilson, L. R. Warden, H. G. Boyle and Thomas Hood. They will generate light, heat and power. Head office, Montreal.

It is stated that work will shortly be commenced on the laying of tracks for the new electric railway from Morrisburg to Ottawa.

#### Odessa, Ont.

The Ernestown Telephone Company, with main office in Odessa, has been incorporated. For further information address J. F. Dawson.

#### Portage la Prairie, Man.

A new telephone exchange building, 40 x 80, will be erected, and will cost \$20,000. It will accommodate a modern central energy switchboard with a present capacity of 1,400 subscribers which can be increased when required to 5,000 subscribers. The construction department under the telephone commission will carry on the building of rural lines in Oakville, Mill Creek, Poplar Point, High Bluff, Flea Island, Oakland, Longburn, Westbourne, Macdonald and Burnside, all of which get connection with Portage la Prairie exchange.

The Manitoba Power & Electric Company has been incorporated with a capital of \$100,000. The provisional directors are: W. H. Carter, A. H. Aldinger and A. J. Williams, of the Carter-Halls-Aldinger Company, Winnipeg, Man.

#### Pilot Butte, Sask.

The American-Canadian Rural Telephone Company was recently organized.

#### Port Arthur, Ont.

The Street Railway Commissioners have decided to call for tenders for four "pay-as-you-enter" cars. For further information address J. J. Carriek.

#### Pembroke, Ont.

The town water commissioners ask for tenders for electric motor and pump.

#### Perth, Ont.

Three independent telephone lines will be constructed in this district during the coming summer.

#### Quebec, Que.

It is reported that the controlling interest of the Quebec Railway, Light & Power Company has passed into the hands of a syndicate, which is desirous of extending



the railway to Murray Bay, a distance of 56 miles. The railway will start from St. Joachim and will cost about \$2,000,000.

#### Rosewood, Ont.

At a meeting of the Rosewood Rural Telephone Company, of which G. Claydon is manager, it was decided to build a line to Ste. Anne.

#### Regina, Sask.

Tenders for the construction of the Estevan-Gainsboro-Alamea-Carlyle telephone line and for the Wapella-Esterhazy telephone line were received until June 1st by S. P. Porter, Deputy Commissioner, Railways and Telephones, this city.

#### St. Catharines, Ont.

The promoters of the proposed Dunnville, Wellandport and Beamsville Electric Railway have been asked to extend their line from Beamsville to Jordan Harbor and St. Catharines. Mr. Gough, the company's engineer, states that should Beamsville, Louth and Clinton townships, and St. Catharines city put up a bonus of twenty thousand dollars, they will build the extension to Jordan Harbor and St. Catharines.

#### Stratford, Ont.

A proposition has been submitted to the city council by N. M. Cantin, of St. Joseph, on behalf of New York capitalists, offering to construct an electric railway between St. Joseph and Stratford, a distance of about 65 miles, upon condition that the city guarantee bonds of the company to the amount of \$250,000.

#### St. John, N.B.

It has been decided unanimously to petition the New Brunswick Legislature, by the New Brunswick Union of Municipalities, to take over the New Brunswick telephone system.

The New Brunswick Telephone Company have commenced operations in the way of underground construction, which consist of laying a conduit. One section will consist of eight ducts, another seven and another six ducts. The ducts will be placed in two layers, four on the bottom, the whole being solidly encased in concrete. The estimated cost is \$18,000. The plans include the laying of an underground system that will cost a quarter of a million dollars.

#### Stratford, Ont.

Mr. N. M. Cantin, St. Joseph, has submitted a proposition to the City Council on behalf of New York capitalists to build an electric railway between St. Joseph and Stratford, a distance of about 65 miles, upon the condition that the city guarantee the bonds of the concern up to \$250,000.

#### Saltcoats, Sask.

Plans are being made by the Saltcoats District Telephone Company to erect about 50 miles of telephone line this season.

#### Swan River, Man.

The question of building a dam on the Swan river for the purpose of supplying power and light is being discussed. An engineer has been engaged to make examinations and take levels, and will report to the town council on the feasibility and cost of producing power.

#### St. Marys, Ont.

The site for the transforming station of the Ontario Power Commission's high tension line was selected recently by Messrs. Gaby and Acres, engineers of the commission.

#### Tregarva, Sask.

The Tregarva Rural Telephone Company has been incorporated, with head office in this town.

#### Thamesville, Ont.

The Thamesville Telephone Company has been incorporated with a capital of \$10,000. The provisional directors are: W. J. Mitton, Camden; T. Marven, J. Coutts, of Thamesville, Ont.

#### Toronto, Ont.

The electrical department is receiving tenders for laying underground conduit.

City Engineer Rust has received a letter from the Kearney High Speed Railway Company, Limited, London, Eng., giving an estimate of the cost of a subway railway system for Toronto. They say that with the Kearney Railway and Kearney single tube systems the cost would probably not exceed \$1,000,000 per mile, including complete equipment ready for running.

The municipalities forming the Niagara Power Union have decided to combine for the purchase of supplies for their distribution plants, and appointed a committee composed of Controller Hocken, Toronto; Dr. F. Guest, St. Thomas; Ald. D. A. Stewart, London; Mayor W. J. Dingman, Stratford; and Mr. Sam Carter, Guelph, together with the officers of the union, to secure from the various municipalities information as to the nature and quantities of supplies required, and also from contractors the terms upon which they could be obtained.

#### Victoria, B.C.

The council is considering the question of securing electricity from the British Columbia Electric Company to supply additional lamps for the present, instead of making extensions to the municipal plant this year as planned, which would require an expenditure of about \$20,000. It is estimated that the company can provide street lamps at \$38 each per year, which will save the city about \$10,000 per year.

The ratepayers have approved the bylaw to raise \$153,000 for the proposed power plant.

It is stated to be assured that the B. C. Electric Railway Company will ultimately establish a generating plant on the Jordan river. A. B. Carey, C.E., of Gore & McGregor, who has been employed by the B. C. Electric Railway Company in their investigations, states that there is a sufficient flow of water to provide 10,000 horse power the year round. The estimated cost of the proposed plant is \$2,000,000. No further developments will ensue until the company and the city come to an agreement.

#### Vancouver, B.C.

The bylaw has been introduced in the council of the municipality of Burnaby to grant a forty-year franchise to the British Columbia Electric Railway Company. It is proposed to construct an electric line from the east boundary of Hastings townsite through the municipality.

The Vancouver Power Company, a subsidiary concern of the British Columbia Electric Company, have been granted permission by the provincial government to raise their Coquitlam dam and thereby obtain an extra 1,000 horse power.

The British Columbia Electric Railway Company will immediately begin the construction of thirteen miles of tramway extensions in the eastern end of the city and suburbs. They have been granted a 40-year franchise.

The British Columbia Electric Railway Company has declared a dividend of eight per cent. on deferred ordinary shares.

Options on water powers situated within fifty miles of Vancouver will be received by the city solicitor. The city is anxious to acquire a supplementary water supply for power purposes.

The City Council recently discussed the appointment of an electrical commission and the securing of water power for the city's own use.

Tenders addressed to W. McQueen, City Clerk, were received until May 20th for motor generator set and switchboard panel.

The B. C. E. R. are authorized to spend \$2,500,000 on extensions during the next year.

The construction of the 100 miles of electric railway, tapping the principal fruit growing centres on both sides of Okanagan Lake, is to be started shortly. The line will be completed within eighteen months. The enterprise was started by local capitalists, who are said to have secured the financial support of the Earl of Aberdeen, viceroy of Ireland, who is the owner of the famous Coldstream ranch near Vernon. The new company was incorporated by special act at the last session of the provincial legislature. J. F. Langan, of Chicago, is stated to be interested.

#### Wilmer, Sask.

The Wilmer Rural Telephone Company has been organized with the following named officers; T. M. Leggat, president; Sanford McNeil, vice-president, and Thos. Larkin, secretary and treasurer.

#### Wellandport, Ont.

Contracts will be let soon by the Dunnville, Wellandport & Beamsville Electric Railway Company, which proposes to build a 22-mile electric railway to connect these three towns. It is proposed to begin work at once. Three or four small bridges will be built, the largest to span the Chippewa creek, and one over the Twenty river. James A. Ross, Wellandport, is president.

#### Windsor, Ont.

According to estimates it will cost the city from \$125,000 to \$130,000 to build a distributing station and transmission lines for Niagara power. The price for electricity from the Hydro-Electric Power Commission in amounts less than 5,000 h.p. delivered at Windsor is \$38 per h.p. per year, which, with the cost of the distributing system, would make the cost about \$45 per h.p. per year.

The Windsor Tunnel and Lake Erie Company expects to start construction on its projected line early in July. This line will connect Windsor, Sandwich, West Vereker, New Canaan, McGregor, Huron and Oxley, and will have a total length of about 30 miles. It is proposed to connect the line with the Detroit river tunnel, and so secure connections with the electric railway lines in Detroit, Mich. The officers are:—President, R. A. Bailey, Detroit; vice-president, Dr. J. A. Smith, Windsor, Ont.; treasurer, W. Boug, Windsor; secretary, J. G. Leggatt, Windsor.

#### Winnipeg, Man.

The Street Railway Company are contemplating improvements, including erection of power sub-stations and rebanding tracks.

During the present year the Manitoba Government, it is said, will spend some \$800,000 on improving and extending its telephone system. According to a statement made by one of the commissioners \$450,000 will be spent on material and \$350,000 on labor. The work will be divided up as follows: Underground and aerial work in Winnipeg, \$160,000; two new exchanges and switchboards in Winnipeg, \$110,000; rural and farmers' lines, \$270,000; alterations and additions to ex-

(Continued on page 80)



**This Space Belongs to**

**The Sunbeam  
Incandescent  
Lamp Company  
of Canada, Limited**

**The Only Makers of**

**TUNGSTEN**

**Lamps in Canada**

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**Factories: TORONTO and ST. CATHARINES**

**North Western Office and Warehouse: 599 Henry Street, WINNIPEG**

**P.S.—WE MAKE CARBON LAMPS TOO**

## For Sale

1 Electric Motor, 60 h.p., 3 phase, 60 cycles, 2000 volts, Made by the C. Q. E. & Co. Nearly new. W. A. HALE, Sherbrooke, Que.

## For Sale

A 3 H.P., 4 Phase, 110 V., 66 Cycle, Canadian General Electric Motor, in good shape; a bargain. Also a 5 H.P. and 15 H.P. Motor and Transformers in stock. NORTH-EASTERN ELECTRIC SUPPLY CO., Orillia, Ont.

## Position Wanted

Engineer with long and valuable experience in construction and supervision of Hydro Electrical Plants is open to engagement May 1st. Experience especially valuable to mining company or with company doing a commercial business with mines. Box 732, ELECTRICAL NEWS, Toronto.

## Position Wanted

Electrical Engineer with ten years' experience in all branches of the business is open to engagement May 1st with light, power or traction company, as superintendent. Capable of making complete installations and excellent references as to character and business ability. Box 733, ELECTRICAL NEWS, Toronto.

## For Sale

One General Electric A.C. Generator, 60 K.W., 133 cycles, 1,100 volts, speed 1,500. Complete with exciter and switch board instruments. All in A1 condition. Only used a short time. Will sell very cheap. Must be sold. For further particulars apply to ELECTRIC REPAIR & CONTRACTING CO., 119 Lagauchetienne St. West, Montreal, Que.

## Wanted

Position as manager or superintendent of a small hydro-electric plant. 15 years' experience. Familiar with motors, generators, line construction, inside wiring, telephones and high-tension practise. Single, reliable, temperate and a hustler. Holding good position now and have done so for four years, but environments not satisfactory. Apply Box 736, ELECTRICAL NEWS, Toronto.

## Wanted

To manufacture on a royalty basis, specialties or standard lines, electrical or otherwise, by an electrical firm with a well equipped establishment. Address Box 776, ELECTRICAL NEWS, Toronto.

## Wanted

A firm in the United States manufacturing knife switches, switchboards, panel boards, fuse blocks on a large scale wishes to secure representation in both Eastern and Western Canada. Address,

Box 769,

CANADIAN ELECTRICAL NEWS  
Toronto.

## Wanted

To correspond with Canadian firms who are legitimate jobbers of electrical material, who do no contracting or sell electric current, by a manufacturer with a view of establishing agencies in Canada for Standard Electrical Specialties paying a very liberal margin. Box 727, ELECTRICAL NEWS.

**CANADIAN OFFICE & SCHOOL FURNITURE CO. LIMITED**  
PRESTON ONT.

FINE BANK OFFICE, COURT HOUSE & DRUG STORE FITTINGS.

OFFICE, SCHOOL, CHURCH & LODGE FURNITURE

SEND FOR CATALOGUE

J. L. JONES - TOR.

changes, \$104,000; extensions to long-distance lines, \$156,000. Tenders will be called for various supplies from time to time as they are required.

At the annual meeting of the Winnipeg Electric Railway Company, it was decided to issue \$1,500,000 in new stock, the proceeds to be used for extensions and improvements.

It is reported that the Great Falls Power Company is planning to develop the water power of the Winnipeg river and erect a power plant with an output of 180,000 h.p. The canal, it is said, will cost \$1,000,000. H. M. Byllesby, of Chicago, Ill., is reported interested in the enterprise.

Long distance telephone lines are being arranged between the following points in the province: Giroux-La Broquerie; Steinbach-St. Pierre; Stonewall-Warren and Atwell; Souris-Pipestone; Narcoe-Moore Park; Shoal Lake-Oakburn; Strathclair-Elphinstone; Headingly-St. Francois Xavier; Hamiota-Miniota; Foxwarren-St. Lazare; Dominion City-Stuartburn. Long distance circuits are being arranged from Portage la Prairie to Eustache, Sydney to Carberry, Kelwood to Gladstone via Neepawa, Virden to Brandon, Hartney to Deloraine, Souris to Wawanesa, Deloraine to Boissevain, Treherne to Cypress River, Cartwright to St. John's, North Dakota; and Winnipeg to Shanawan. Circuits have already been erected from Browardise to Brandon, Morris to Morden, Killarney to Ninga, and Morris to Myrtle.

## AWARDED.

### Chatham, Ont.

The Chatham, Wallace & Lake Erie Railway Company have recently placed contracts for two Gould storage batteries.

### Toronto, Ont.

The contracts have been awarded for the cables and conduits for the city's electrical distribution plant. In both cases the contract was given to the lowest tenderer. The contract for the cables goes to the British Insulated and Helsby Cables, Limited, Prescott, Eng. The prices vary from twenty cents to \$1.34 per foot, according to the different sizes and voltages. From seventy-five to one hundred thousand feet of cable will be used. The contracts for the conduits will go to the American Sewer Pipe Company, of Akron, O., the price being 4 7-10 cents per foot. The single duct conduit will be used. There were no Canadian tenderers, as none of this kind of work is done by Canadian manufacturers. These contracts cover the southern portion of the city from Dufferin street to the Don and south to Queen street.

### Vancouver, B.C.

The B. C. E. R. have awarded to Naylor Bros., of Huddersfield, Eng., the contract for the enlargement of their hydraulic tunnel connecting lakes Coquitlam and Butzen. The cost involved in the plans now being carried out for the improvement of the hydraulic power in connection with the North Arm generating plant is \$300,000. At the present time a contract is let for one electrical unit of 10,000 horsepower, and it is expected that this will be followed in a year or so with an order for the installation of another of 20,000 horsepower.

### Winnipeg, Man.

Contracts have been awarded by the Board of Control for furnishing and installing one turbine pump, with a capacity of 25,000,000 gallons per 24 hours, and one 350 horse power motor to the Northern Electric & Manufacturing Company for \$11,000. H. N. Ruttan, city engineer.

## Winnipeg Point du Bois Hydro-Electric Development

## Tenders for Equipment of Generating Station

Sealed tenders on prescribed forms addressed to the Chairman of the Board of Control, Winnipeg, Canada, and marked on the envelope "Point du Bois Hydro-Electric Development, Tenders for" will be received at the office of the undersigned up to 11 a.m. on MONDAY, AUGUST 2ND, 1909, and MONDAY, AUGUST 16TH, 1909, as below, for the manufacture, delivery and erection of the hydraulic, electric and auxiliary equipment of the Municipal Generating Station on the Winnipeg River.

The specifications and plans will be on exhibit after June 15th at the office of the following:—Engineering, London, Eng.; Engineering News, New York City, Smith, Kerry & Chace, Toronto, Wm. Kennedy, Jr., Y. M. C. A. Building, Montreal, and Smith, Kerry & Chace, Winnipeg.

Copies of the Instructions to Bidders, of the Plans Specifications and Form of Tender, may be obtained from the Power Engineer's Office, Carnegie Library Building, Winnipeg, and at the Office of "Engineering" London, Eng., after June 15th, but the application for these must be accompanied by deposit, as listed below, for each section applied for. This deposit will be returned to the applicant only upon the return to the Power Engineer's Office of the plans and specifications in good order.

Each tender must be accompanied by a certified cheque payable to the City Treasurer for the sum called for in the corresponding Instructions to Bidders, which cheque will become forfeit to the Corporation in the event of the successful tenderer refusing or neglecting to execute a satisfactory contract when called upon so to do.

Tenders will be received upon the following sections:—

- \*A.—Specifications Nos. 5 and 6 respectively for 5200 H.P. Turbines (5)  
450 H.P. Turbines (2)  
Deposit \$250.00.
- \*This tender returnable August 2nd, 1909.
- B.—Specifications Nos. 7, 8 and 11, respectively, for 3000 K.W. Generators (5)  
250 K.W. Generators (2)  
Switching and Accessory Apparatus  
Deposit \$250.00.
- C.—Specification No. 10 for Step up Transformers (6)  
Deposit \$100.00.
- D.—Specification No. 12 for Light, Heat and Power Systems.  
Deposit \$50.00.
- E.—Specification No. 23 for Protective Apparatus  
Deposit \$50.00.
- F.—Specification No. 25 for Electric Travelling Cranes (3)  
Deposit \$50.00.
- G.—Specification No. 27 for Auxiliary Apparatus  
Deposit \$100.00.

As an alternative, tenderers may include or group together one or more of the above section providing that they have also tendered for the individual sections of such grouping.

The Board reserves the right to reject any or all tenders or to accept any tender, which shall appear advantageous to the City of Winnipeg.

M. PETERSON,  
Secretary.

Office of the Board of Control,  
Winnipeg, Canada, May 31st, 1909.

**P** PROCURED IN ALL COUNTRIES - LONG EXPERIENCE IN PATENT LITIGATION

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**PATENTS** PHONE MAIN 2582

**RIDOUT & MAYBEE**  
103 Bay Street  
TORONTO, CANADA



# Announcement

## The Tungstolier Company

— of Cleveland, Chicago and New York —

will immediately begin operations  
in Canada under the name of

## The Tungstolier Company of Canada

Limited

Temporary Address : Corner of Dufferin and Liberty Streets  
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This Company takes the Tungsten Lamp and makes of it an Illuminating System, by the application of reflectors and a properly designed fixture which at once insures the proper position, protection and elevation of the lamps, and also permits area lighting.

**Tungstoliers** are made for every illuminating requirement.

TELEGRAPHIC ADDRESS:  
 "INSULATOR," MONTREAL  
 CODES: A. I. AND WESTERN UNION

Capital \$7,300,000.00

TELEPHONE :  
 MAIN 1521, MONTREAL

# British Insulated & Helsby Cables Limited

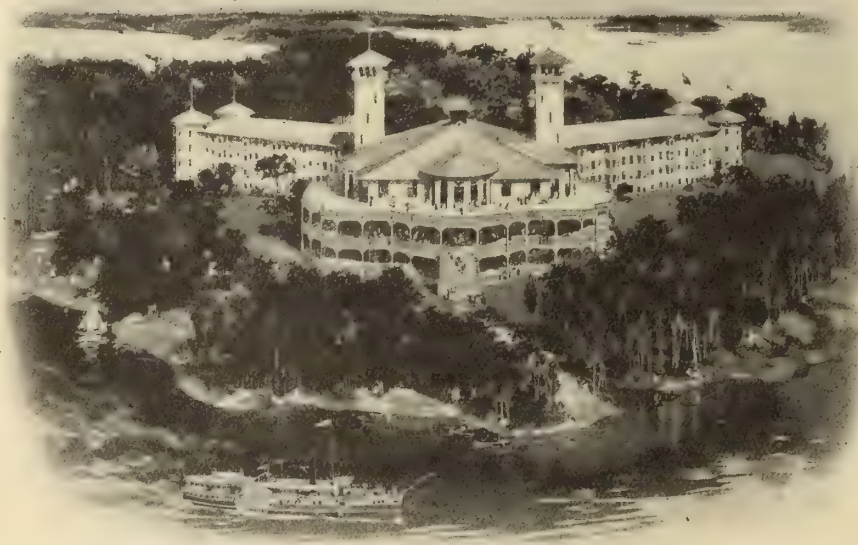
Contractors to **H. M. Government, War Office, Admiralty**, also to the Principal Corporations in the British Isles and Abroad for Electric, Traction, Power, Lighting, Telephone and Telegraph Equipments. Also Manufacturers of Paper, Lead Covered, Rubber, Gutta-percha and Bitumen Insulated Cables; Flexible Cord, Cotton Covered Wires, etc., etc. Also Junction Boxes, Section Pillars, Overhead Tramway Gear, Bonds, Switchboards, Meters, Telephone Instruments, Exchange Equipments, Batteries, Insulators, Fire Alarm and Police Equipments, Railway Signals, Blocks, etc., etc.

Head Office for Canada, United States and Mexico:

**BRITISH INSULATED & HELSBY CABLES, Limited**

LAWFORD GRANT,  
 Manager.

Power Building - MONTREAL



## "Royal Muskoka" Hotel

was built and furnished at a cost of over \$200,000, and is without any doubt the largest and finest summer hotel in Canada; in fact there are none better on this continent. Its location is unsurpassed, being in the centre of the famous Muskoka Lakes District, a thousand feet above sea level. The interior of the hotel is planned to the best advantage for comfort and convenience, special attention being given to sanitary arrangements. Single rooms, with or without bath, and magnificently furnished suites with private baths; hot and cold water, elec-

tric light and bells in each room; open fireplaces, steam heat, etc. The cuisine is unsurpassed. The grounds of the hotel, one hundred and thirty acres in extent, contain many beautiful walks and cool resting places, all commanding lovely views. There are **Tennis, Golfing, Bowling, Boating, Fishing and Bathing** grounds and many enjoyable water trips. First-class Orchestra in attendance during the season. Golf grounds, with club house, within three minutes walk of the hotel. Thoroughly equipped boat livery. Mail and express service twice daily. Guests for the "Royal Muskoka" should see that their baggage is checked direct to the hotel. Rates \$3 and upwards per day, and \$15 and upwards per week. We would advise parties desiring accommodation to write or wire at once, as a very large number of rooms are already engaged. For booklet, plans, etc., address **L. W. MAXSON, Manager, Box 502, "ROYAL MUSKOKA," LAKE ROSSEAU, ONTARIO, CANADA.**



# Does a Saving of from 25 to 50 per cent. of Your Power Cost Interest You?

## MR. MANUFACTURER :

You know that your one best step towards greater profits is reduction in cost of production.

You also know that one of the big items of cost is power—perhaps the biggest.

Now wouldn't it interest you—wouldn't it mean money in your pocket—if you could save from a quarter to one half of what your power is costing you to-day?

Now it is just that saving that we wish to tell you of. Even though your plant is equipped much above the average, it is to your interest to know about this still better system.

We want to give you all the facts about Western Electric Induction Motors and prove to you conclusively what saving in dollars and cents and what increase in efficiency that system of power will effect in your plant.

Look your plant over and figure out how many tons of metal you keep rotating over the heads of your workmen and how many square feet of belting you keep travelling at express train speed.

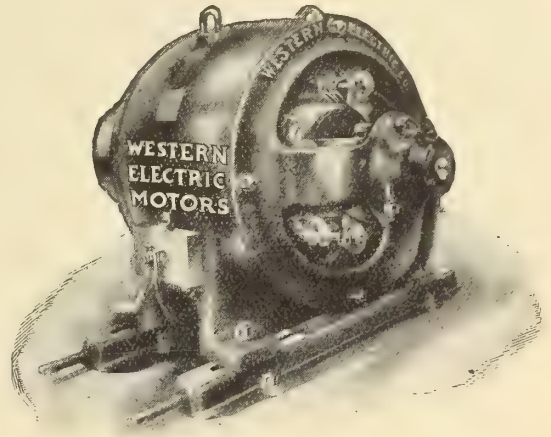
It takes power to keep that mass of non-productive machinery moving. Power that costs you money and adds nothing to the production of your plant.

Twenty-five to fifty per cent. of power developed by your engine is lost by the line shaft and belt transmission system. This fact has been repeatedly proven by actual tests.

You can save this loss—add it to your profits by installing Western Electric Induction motors.

They can be mounted on the floor, wall or ceiling as required, or on the machines which they are to operate, thus eliminating all belts and hangers.

Western Electric Induction Motors are the simplest of all elec-



trical machines. In operation they are as simple as a shaft rotating in its bearings and require no attention beyond that given to bearings.

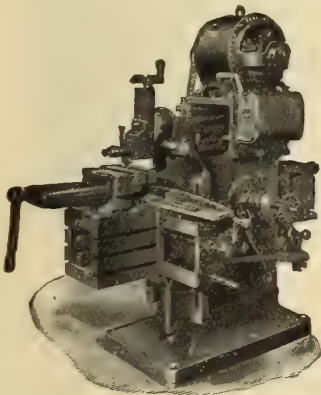
The individual motor driven machines form compact units in themselves, thus allowing the workmen to get around them better and do better work. Besides this you pay only for the power used in actual production—only the machines which are actually employed in turning out your product need be kept running.

Western Electric Induction Motors are the result of 30 years of untiring efforts at improvement. That the Western Electric Company have produced \$230,000,000 worth of electrical apparatus during the last five years is a significant fact that speaks volumes for the efficiency of their apparatus.

These are but a few of the facts about Western Electric Induction Motors. If you are interested in increasing the efficiency of your plant—if you are interested in cutting down the cost of your power—write to-day for Bulletin No. 107.

We would be glad to have our engineers look over your plant and prove to you by actual figures what a saving you can effect by installing Western Electric Motors. This service is absolutely free and puts you under no obligation to us.

Write to-day for Bulletin No. 107 and full particulars.



## THE NORTHERN ELECTRIC AND MANUFACTURING CO. LIMITED

### MONTREAL

Cor. Notre Dame & Guy Sts.

### TORONTO

60 Front St. W.

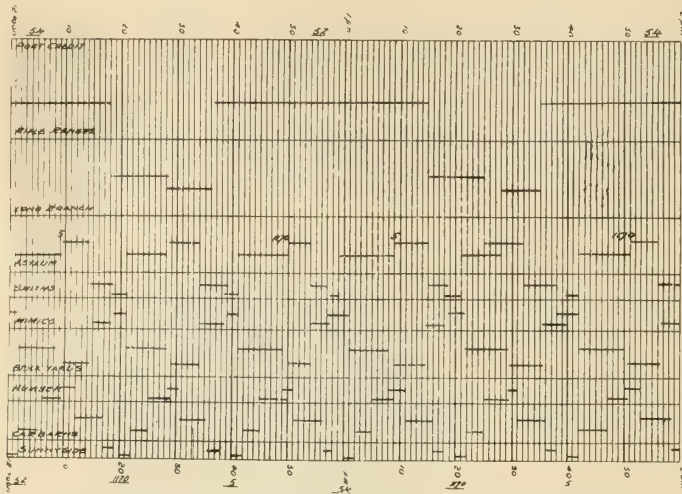
Manufacturers and Suppliers of all apparatus and equipment used in the construction, operation and maintenance of Telephone and Power Plants

### WINNIPEG

599 Henry Ave

### VANCOUVER

424 Seymour St.



Despatcher's Record—Portion of Despatcher's Sheet actually made on Mimico Division, Toronto and York Radial Railway, May 24th, 1909.

By the use of this your System despatcher is in constant touch with all your cars and crews at all times. He has a complete knowledge of just where every car is and how fast it is travelling. He can signal direct to the motorman in his cab to stop or proceed. He is in direct telephone communication with the motorman on the car, and if you wish you can control his speed over any portion of road so desired.

If motorman refuses to answer danger signal, air brakes can be applied whether motorman wishes or not.

Your despatcher is protected from giving wrong signal by interlocking switch-board.

Your road can be equipped at a small expense, in fact less than you are spending to-day for despatching devices and no protection.

**Why** not avoid all this kick of cars being late?

**Why** not avoid guess work as to the position of your cars?

**Why** not avoid accident inquests, when you have within your easy reach the cheapest safest and most accurate despatching and signal devices on the market to-day?

**Get** in Line and send us a sketch and time table of your line and we will be glad to furnish you our plans, estimate of cost and full information.

The Toronto & York Radial (Mimico Division) is now operating this System, making from 2,500 to 4,500 daily signal indications.

Call and give it your closest inspection.



Despatcher at Work—Toronto & York Radial Railway.

**Do** you want to know what each car is doing on your line?

**Do** you want your cars on schedule?

**Do** you want to avoid accidents?

**Do** you want an indisputable record of your cars' movements?

**Do** you want complete control of your men from start to finish?

If so, your wants can be supplied by the adoption of the

## Simmen Automatic Railway Signal Devices

# Simmen Automatic Railway Signal Co.

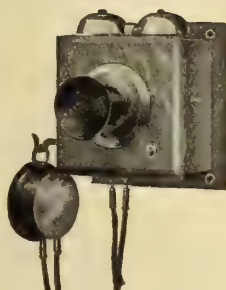
Security Building, LOS ANGELES, CAL.

Canadian Office: 1753 Queen St. West, (Sunnyside), Toronto, Ontario

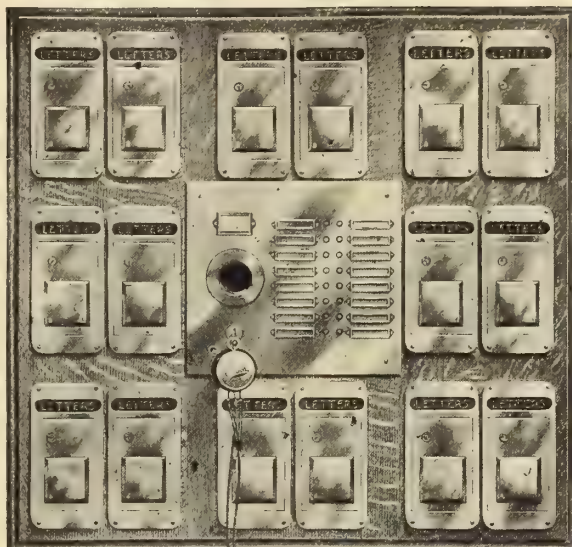


*Norton-System*

# Apartment-House Systems



No. 33—4 1/2" x 5"  
Suite Phone



No. 47—Vestibule



No. 46—Janitor

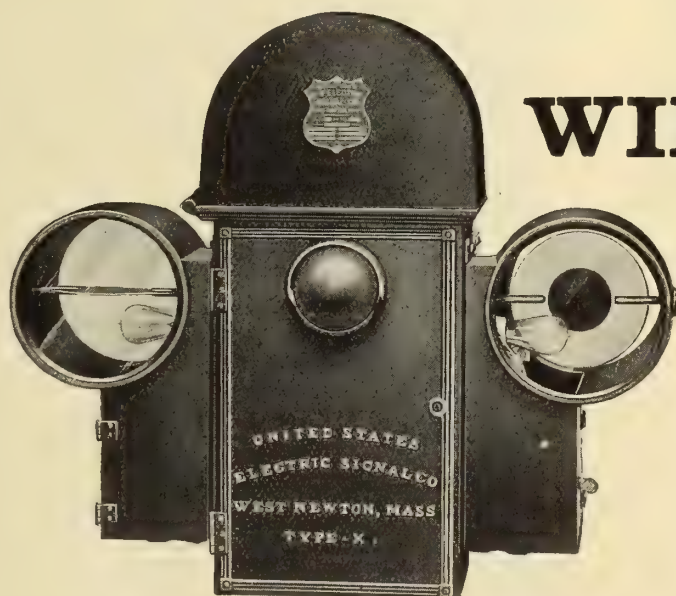
## Specialists in a Special Line

Send for Special Bulletin

NORTON TELEPHONE MFG. CO., Limited, Toronto

*Norton-System*

# A WINNER



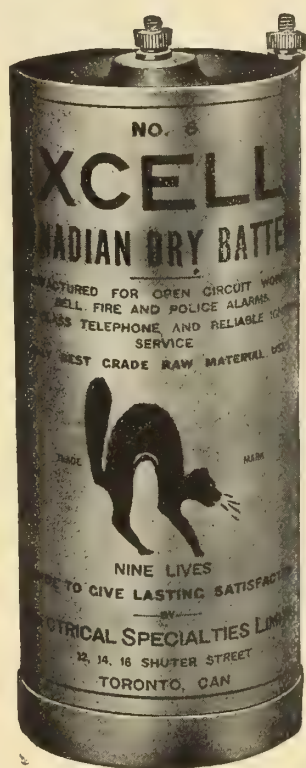
THE NEW CAR COUNTING SIGNAL IS A DEVELOPMENT,  
NOT AN EXPERIMENT; A GROWTH, NOT AN INNOVATION;  
A FULFILMENT, NOT A PROMISE.

**United States Electric Signal Co.**  
WEST NEWTON, MASS., U. S. A.

Send for Bulletin No. 3.

# United States Batteries Invaded Canada

**But Canada Licked Them  
and Gave Them the Ha! Ha!**



Importations in Electric Dry Cells have fallen off 70%—fully  
**SEVENTY PER CENT.**

## **WHY ?**

Because CANADIAN X CELLS have proven their **SUPERIORITY** and ability to show **NINE LIVES**.

## **There is QUALITY**

Then, Jobbers, Dealers, Contractors can **MAKE MONEY** in handling X CELLS while the margin on imported batteries has gone to pieces.

## **There is PROFIT**

Further every X CELL will give absolute satisfaction.

## **There is GUARANTEE**

## **SHE NEVER SLEEPS, OUR BLACK CAT**

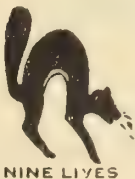
The name of your friend who handles X CELLS is proof to you that you could not get stuck. These firms handle **RELIABLE** goods only.

### **X CELLS ARE FOR SALE BY**

Canadian General Electric Co., Limited	Toronto	Mechanics Supply Company	Quebec
Central Electric & School Supply Co., Ltd.,	Toronto	Montreal Electric Co.	Montreal
Dawson and Company, Limited	Montreal	Northern Electric & Mfg. Co., Ltd.	Montreal
John Forman	Montreal	R. E. T. Pringle Co., Limited	Montreal
C. H. L. Keeler Co.	Toronto	Rogers Electric Co., Limited	Toronto

If you do not find the name of your supply house in this list, write us.  
We will take care of you and will keep you smiling at battery troubles

TRADE MARK



# Electrical Specialties, Limited

## TORONTO

TRADE MARK



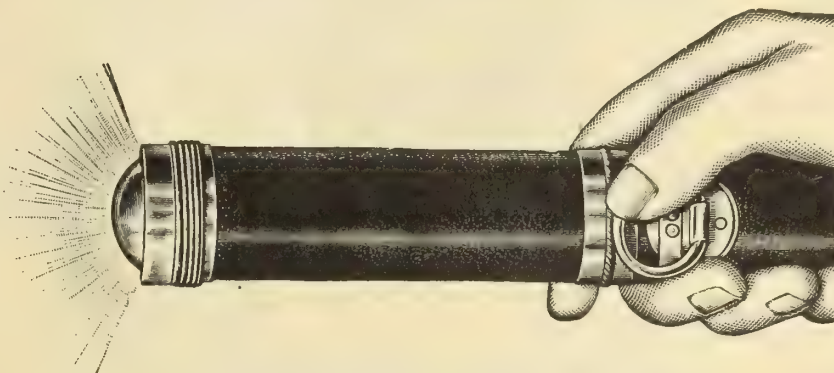
**Fresh Batteries Shipped on Day Your Order is Received**



# ELECTRICAL NOVELTIES

Full Line Renewal Batteries for all Makes

Send for Our  
No. 21.  
Novelty  
Catalogue.  
**FREE**



Largest Stock  
in the  
Dominion  
in this line of  
goods.

Remember, if prices and prompt shipments count, try us for **EVERYTHING ELECTRICAL**

WHOLESALE

## Sayer Electric

AND RETAIL

10-12-14 Beaver Hall Hill,

Montreal



The Name of  
**King**

stands for everything that's good in the

**Gas and Electric  
Fixture  
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Estimates free      Designs submitted

Fixtures Made to Architects' Designs

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Just Back from Europe—and We are the Only House with a Full  
Line of

## Glass Shades for Wolfram Lamps

**Midland Electric Company, Limited**

119-121 Youville Square, Montreal



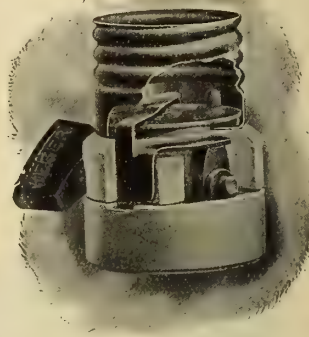
## MUNDER SOCKETS

ARE REPLACING

ALL OTHER MAKES

ARE YOU SELLING THEM?

**MUNDERLOH & CO., MONTREAL**



**“Galvaduct”  
and  
“Loricated”  
Conduits**

**FOR INTERIOR CONSTRUCTION  
Conduits Company Limited**

Sole Manufacturers under Canadian and  
U. S. Letters Patent

**TORONTO - CANADA**

**The Electrical Construction Co.  
of London, Limited**

32-40 Dundas Street, London, Can.—Phone 1103.

Perfection Type

## **DYNAMOS AND MOTORS**

Multipolar, Bipolar, Direct Connected or Belted.

High efficiency. Designed for any required  
speed or voltage. We contract for complete in-  
stallations. We repair machines of any make.

Estimates Cheerfully Given

Descriptive matter furnished  
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LONG DISTANCE PHONE MAIN 3149

# Electrical Repairs

We can keep you running while we make your repairs

WRITE US

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THE STANDARD  
FOR  
RUBBER  
INSULATION

Okonite  
Insulated

# Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Candee, President.  
H. Durant Cheever, Treasurer.  
Geo. T. Manson, General Superintendent.  
W. H. Hodgins, Secretary.

The OKONITE COMPANY,

253 Broadway, NEW YORK, U.S.A.

## LAURENCE, SCOTT & COMPANY, Limited

Contractors to the British Admiralty, War Office, etc.

CANADIAN REPRESENTATIVE

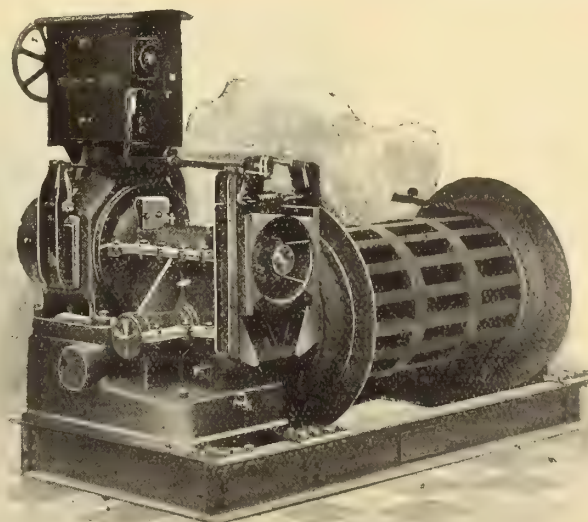
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Manufacturers of

### Direct Current Motors and Dynamos

Used Throughout the World

Coal and Ash Conveyor Apparatus,  
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Motors, and Inter-pole Adjustable  
Speed Motors for Machine Tools,  
Vertical Motors for **SEWAGE** Work.



Colliery Haulage Gear, 40 H.P., 300 ft. per minute  
with double brake gear.

# The Ferranti Meter

This Meter  
is  
doing the work  
to the  
entire satisfaction  
of  
our customers.

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Western Sales Office:  
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Manager.  
Winnipeg



Polyphase Type

One User states:—

Out of Seven Hundred Ferranti Meters which we have in use, no trouble or fault has been found with a single meter.

Eliminate your  
meter troubles  
by adopting the  
"Ferranti."

Canadian Branch:  
**Geo. C. Royce**  
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# Westinghouse Transformers

Known for their reliability, low losses and long life.



Designed for operation  
on all commercial light  
and power circuits.

## Canadian Westinghouse Co., Limited

GENERAL OFFICE AND WORKS: HAMILTON, ONT.

Traders Bank Bldg.  
TORONTO.

For particulars address nearest Office:

439 Pender St., VANCOUVER.

922-923 Union Bank Bldg., WINNIPEG.

232 St. James Street,  
MONTREAL.

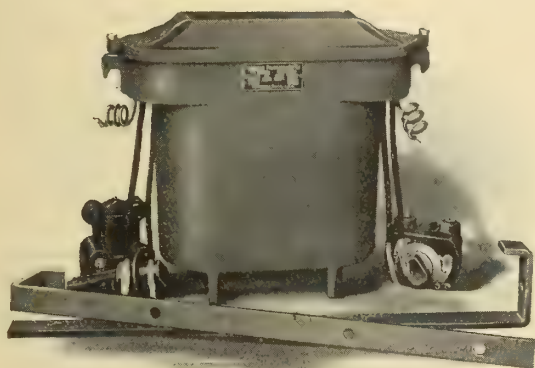
158 Granville Street, HALIFAX



# "Peerless"

The Transformers you will eventually buy. : : : : :

## Why NOT NOW?



If we did not know that

# Peerless Transformers

would more than bear out every claim we make for them, would we not be monumentally foolish to guarantee them as fully as we do? : : : : :

We make many kinds, for many purposes—but one quality only—the best. : : : : :

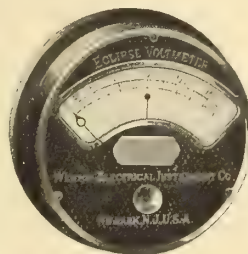
Full particulars and prices are waiting for you. Will you have them? : : : : :

**The Enterprise Electric Co.**  
Warren, O.

Sole Canadian Agent:

**A. H. W. JOYNER**  
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**Electrical Contracts Awarded**

Edmonton, Alta.

The contract for grading five and one-half miles of streets for street car line has been awarded to Lubbock and Matheson, whose tender was the lowest. The tenders were Lubbock & Matheson, \$1,925 per mile; Manders & Miller, \$1,950 per mile; S. E. Patton, \$2,985 per mile. The specifications call for the grading of the road-bed, laying of ties and steel ready for the rolling stock. The tender of the Globe Lumber Company, Revelstoke, B.C., for three cars of 35-foot poles and a double car of 40-foot poles was accepted. The following tenders were received for the structural steel for the new power house extension and for the elevated coal bins of 350 tons capacity. The prices are for completed steel work f.o.b. Edmonton, and erected on foundations—Can. Bridge Company, building \$14,423, coal bin \$3,198, total \$17,621; Edmonton Ironworks, building \$14,404, coal bin \$2,365, total \$16,460; Wisconsin Bridge Company, \$16,460; North Supply Company, building \$13,419, coal bin \$4,600, total \$18,019; Dominion Bridge Company, building \$16,200; Edmonton Dis. Company, building \$14,368, coal bin \$2,400, total \$16,768. The contract was given to the Edmonton Iron Works for \$16,460. The purchase of a street railway water sprinkler from the Preston Car Company, Preston, Ont., for \$2,740 was ordered.

Lachine, Que.

The panelboards for St. Ann's Convent are being furnished by the Hill Electric Switch and Manufacturing Company, Limited, Montreal. The wiring is being done by Picard & Lalonde, Montreal.

Montreal, Que.

The contract for the lighting and distributing panels for the new factory of the Canadian Spool & Cotton Company has been awarded to the Hill Electric Switch & Manufacturing Company, of this city. **Saskatoon, Sask.**

St. John, N.B.

A complete Gamewell Auxiliary Fire Alarm System is being installed for the new Intercolonial Railway terminal at St. John, N.B. The Vaughan Electric Company, Limited, of St. John, have the contract, and will install 53 auxiliary boxes, one main box with auxiliary attachment and also a complete terminal apparatus for their operation.

Toronto, Ont.

Contracts have been awarded by the Hydro-Electric Commissioner to the Dominion Wire Manufacturing Company of Montreal, for copper wire, and to the Ohio Brass Company, of Mansfield, Ohio, for the suspension insulators, their tender being the lowest. The electrical equipment of the protective system in the stations will be supplied by the Westinghouse Company.

Vancouver, B.C.

Boyd & Craig have the contract for grading the Hastings street extension of the British Columbia Electric Railway, which extension will cost \$70,000. Tenders have also been called for the Powell street extension.

The British Columbia Electric Railway Company has awarded the contract for 390 miles of aluminum wire, which will be used for transmission purposes on the Chilliwack line. The tender of the Great Northern Aluminum Company of Montreal was accepted at \$45,000. This company is a Canadian branch of the Pittsburgh Reduction Company, and has its works at Shawinigan, Quebec.

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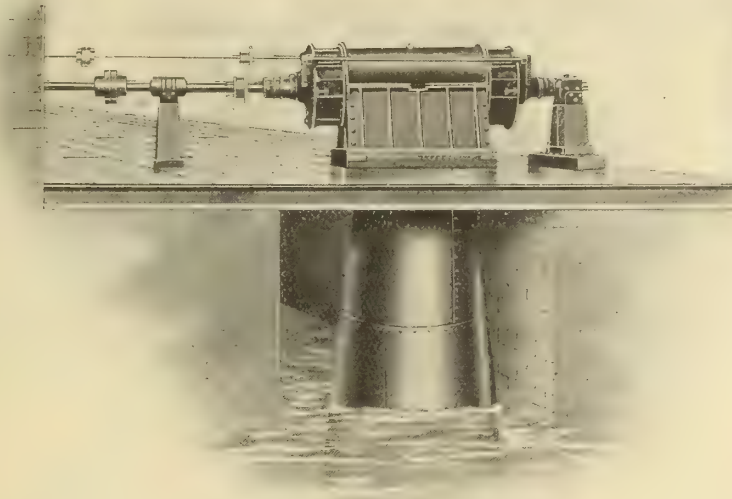
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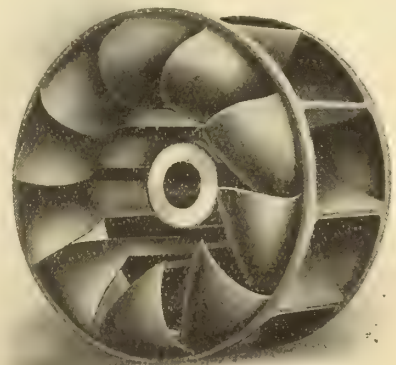


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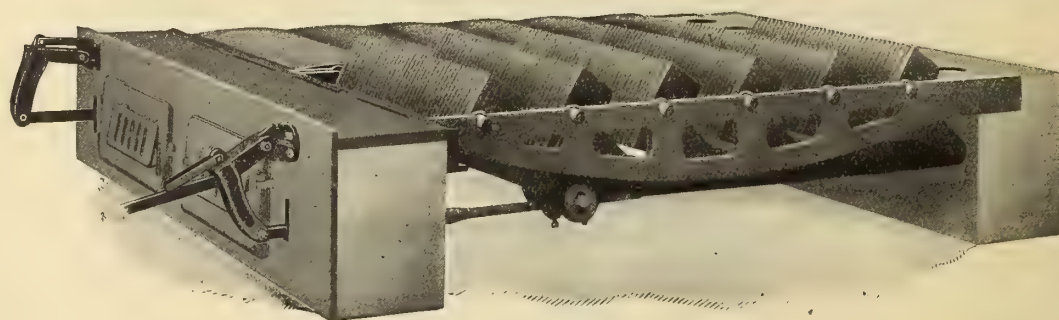
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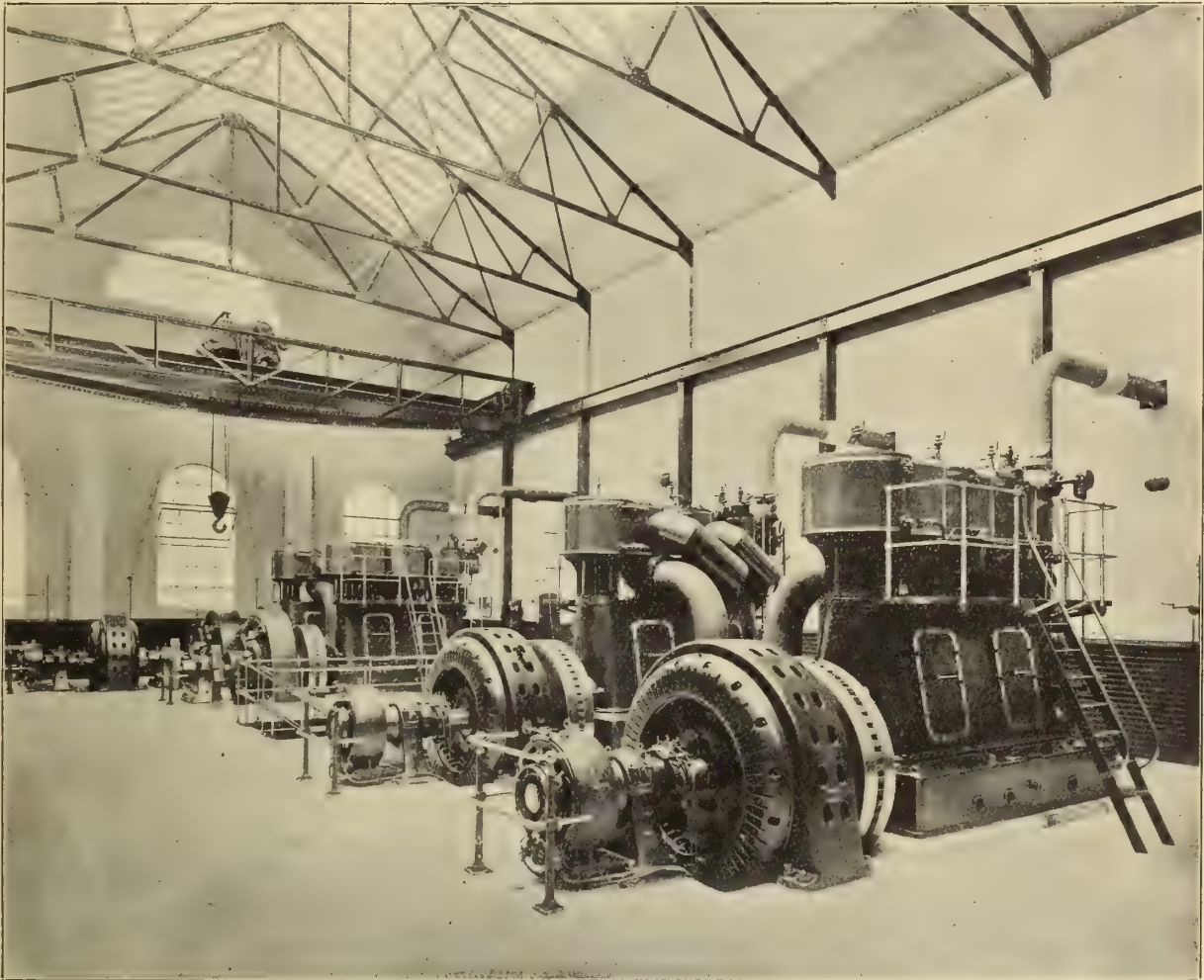
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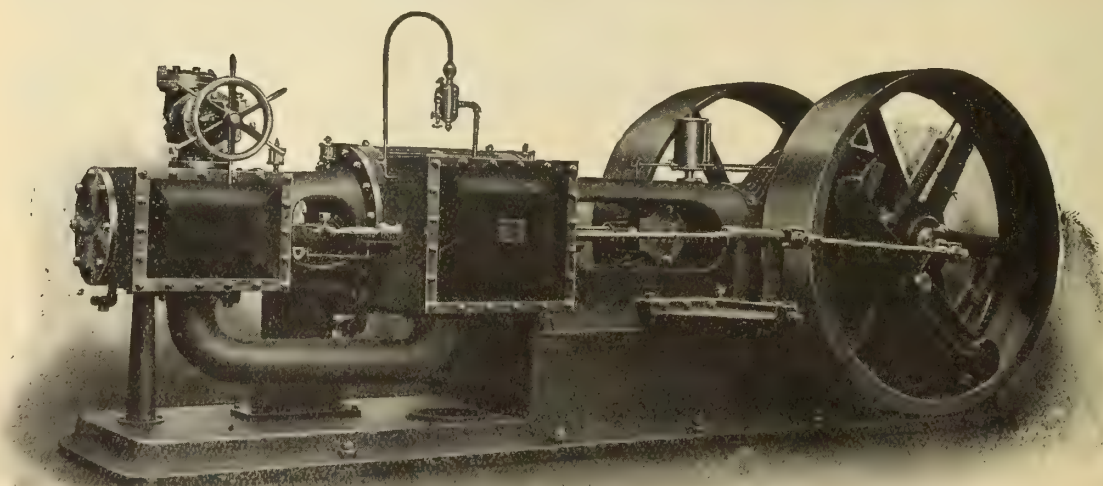
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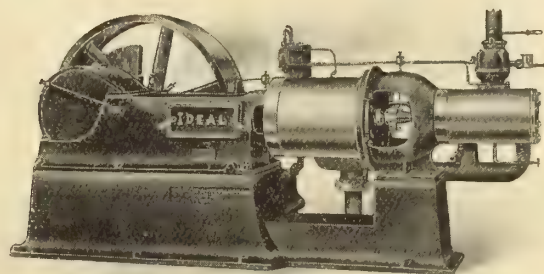
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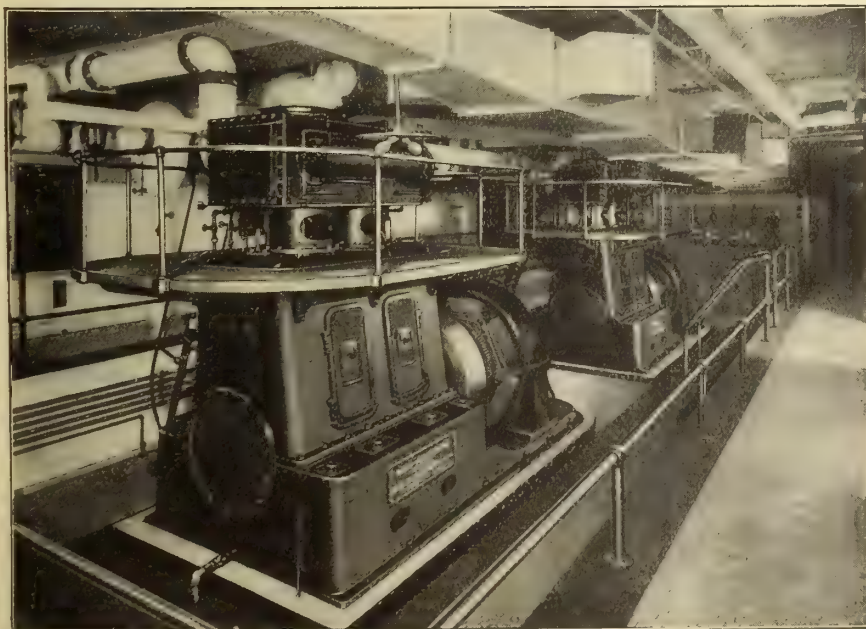
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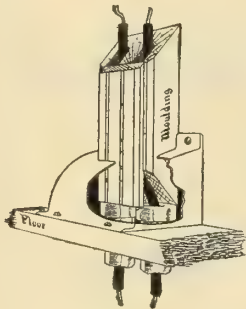
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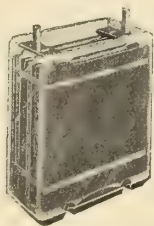
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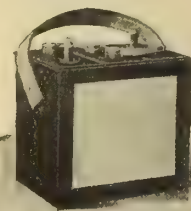
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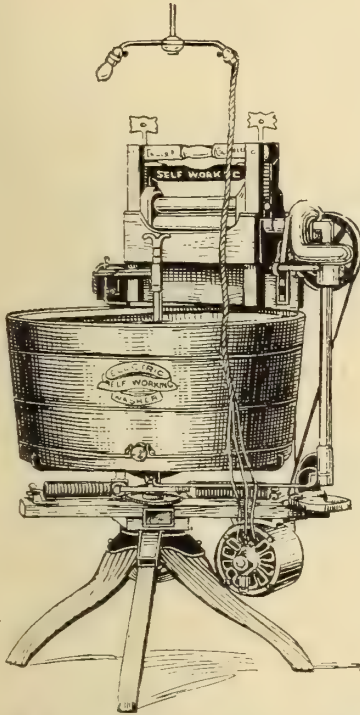
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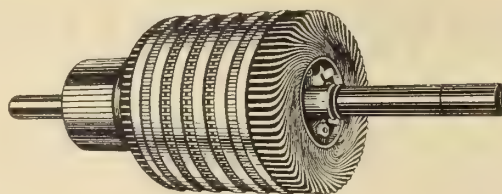
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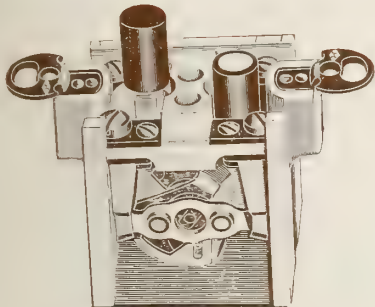
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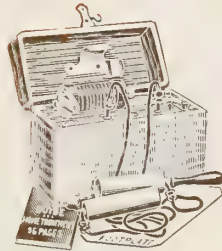
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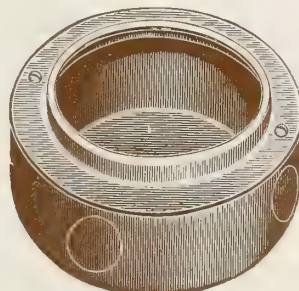
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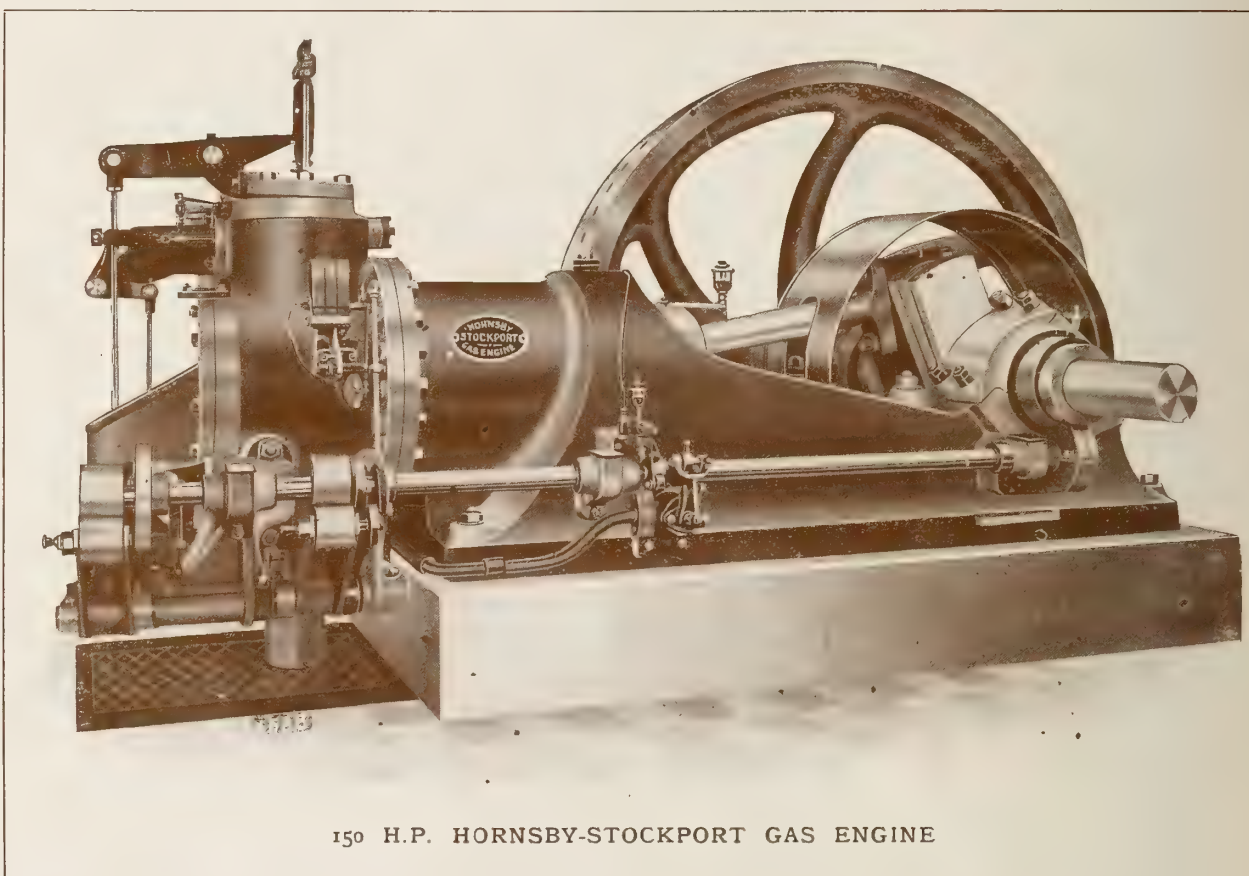
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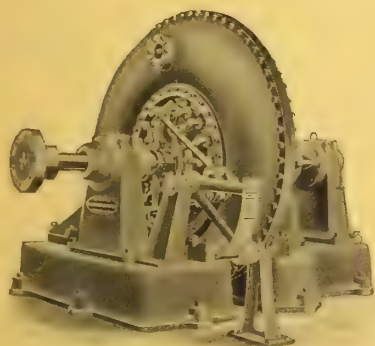
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**Wire**

**Guy Anchors**

Tools of all kinds, etc.

A very complete stock also carried of Supplies for Telephone Construction

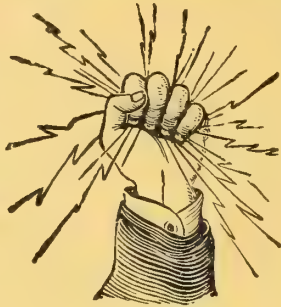
When next in the market kindly give us an opportunity to quote

**Canadian General Electric Co., Limited**

Head Office: Toronto, Ont.

District Offices: Montreal   Halifax   Ottawa   Cobalt   Winnipeg   Vancouver   Rossland

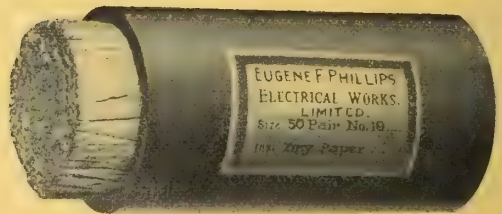
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Bare and Insulated Copper

## WIRES AND CABLES

For Telephone, Telegraph, Lighting,  
Power and Street Railway Equipment



Bare and Insulated Electric Wire and  
Cables for Aerial and Underground use

## Railway, Feeder and Trolley Wire

Weatherproof Magnet  
and Rubber Covered  
Wires and Cables



Incandescent and Flexible Cords



## Eugene F. Phillips Electrical Works, Limited

MONTREAL

CANADA

Branches: Halifax, Toronto, Winnipeg, Vancouver



# Benjamin Tungsten Streetlites

Open Up New Highways for the Use of

## Tungsten Lamps

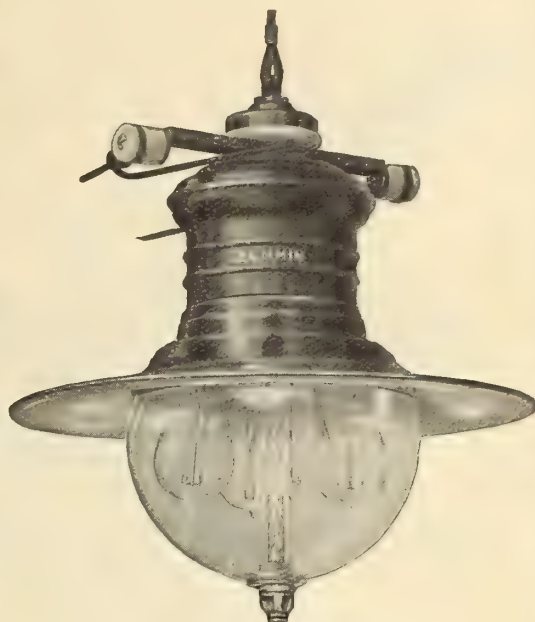
5-Lt. Fixtures, 40 to 60 Watt Lamps.



Cat. No. T-714.



4-Lt. Fixtures  
40 to 100  
Watt Lamps.



Cat. No. T-74.

Good Construction—Good Appearance—Good Lighting Results.  
An Efficient Substitute for Arc Lamps.

Let us send you our Tungsten Bulletin No. 4.  
Write for our New Catalogue C-19.

**Benjamin Electric Mfg. Co.,** 64 York Street  
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# "DIAMOND H"

## SWITCHES

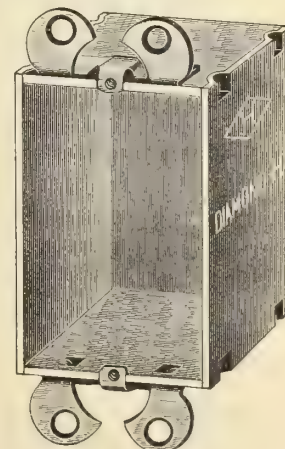
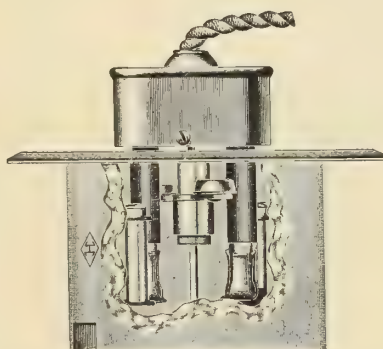
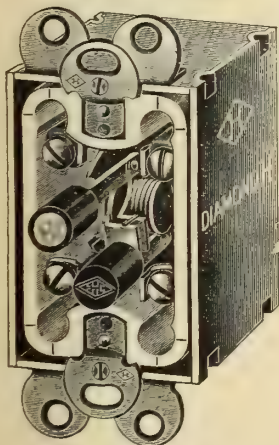
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



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Galvanized Steel all Cases  
Automatic Flush Receptacles and Plugs

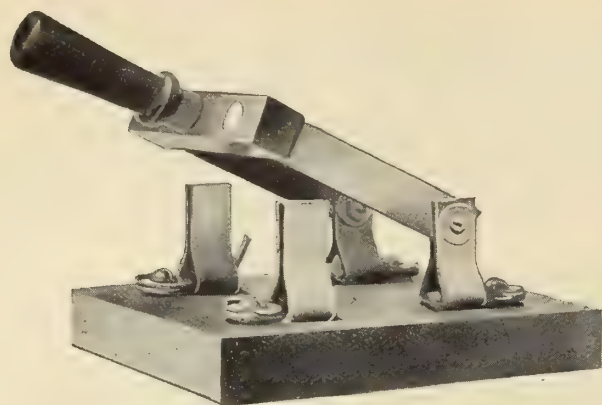


MANUFACTURED BY THE HART MANUFACTURING CO., HARTFORD, CONN.

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**C. W. Bongard Co., Ltd.,**

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**Toronto Can.**



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**Switches Mounted on Slate**

25 Amperes at 250 Volts

**30 Cents Each**

Order at once.

**The Hill Electric Switch & Mfg. Co.**  
Limited

1560 St. Lawrence St. - Montreal

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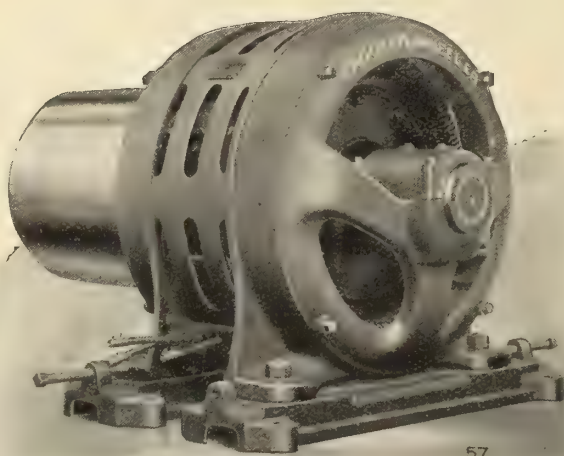
—Manufacturers of High-Grade—

**Switches, Panel Boards  
and Switchboards**

Quotations promptly made upon  
request when drawings or suffi-  
cient data are submitted.

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are just as good as Crocker-  
Wheeler Direct Current  
Apparatus. Could you  
ask for anything better?

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MANUFACTURERS AND ELECTRICAL ENGINEERS

Head Office: 41 Street Railway Chambers, MONTREAL



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579 St. Paul Street, MONTREAL

Switchboards

Oil Switches

2,000 Volt  
Motor Starting  
Apparatus

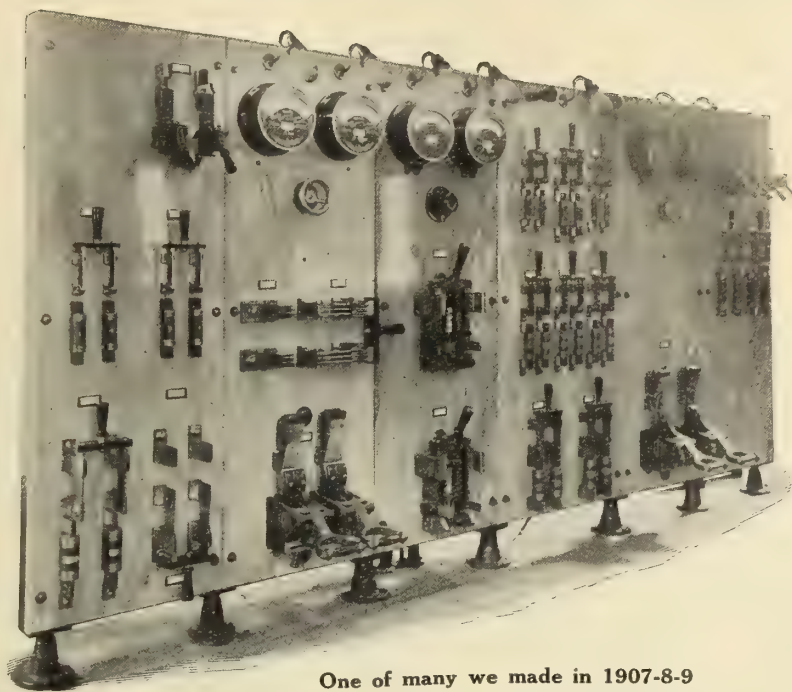
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Electrical  
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Commutators

Sockets

Rosettes

Electrical  
Supplies



One of many we made in 1907-8-9

Special  
Mechanical  
Apparatus

Tools

Special Machinery  
designed or built to  
specifications.

Metal  
Novelties

We solicit an op-  
portunity to quote  
on your require-  
ments.

## "SHAWMUT"

### N. E. Code Standard Enclosed Fuses



Very careful tests of various Fuse Constructions as found in different makes of Fuses, under the most severe Short Circuit show that our Fuses act perfectly inside and out.



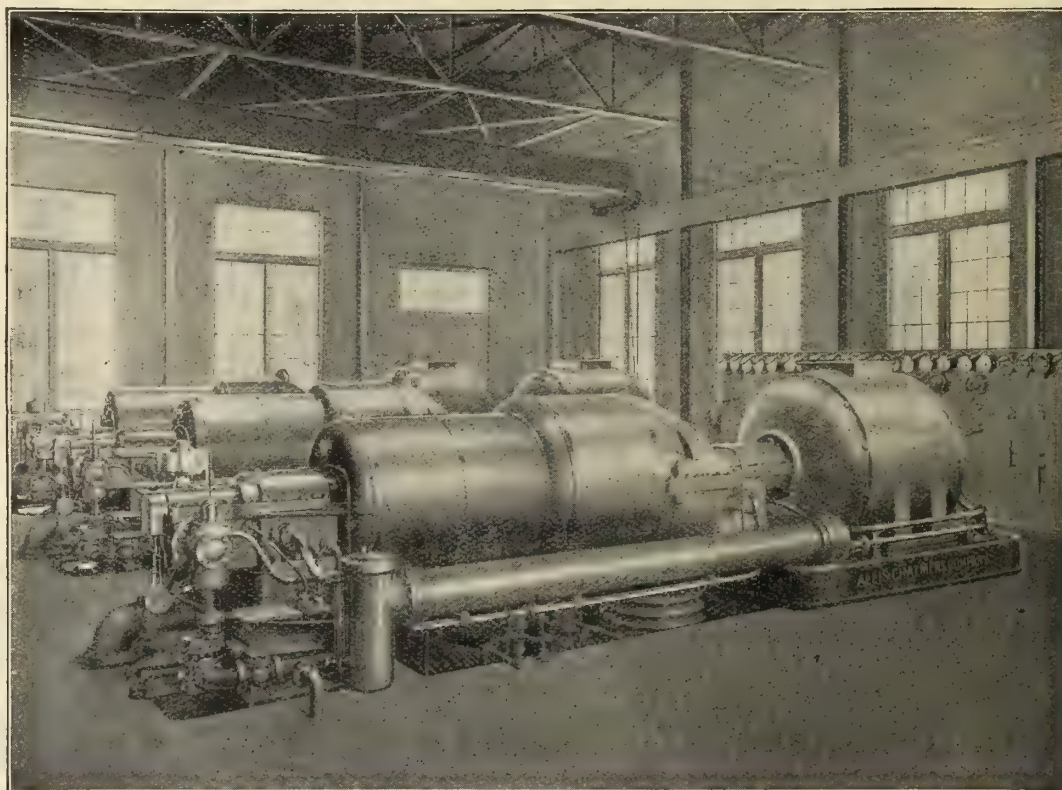
Why Not Try Them?

## CHASE-SHAWMUT CO.

NEWBURYPORT, - MASS.

# Steam Turbines and Generators

All Capacities from 300 K.W. to 20,000 K.W. — High or Low Pressure.



THREE 1,000 K. W. STEAM TURBINES AND GENERATORS IN THE POWER HOUSE OF THE WESTERN CANADA CEMENT AND COAL CO., LIMITED, EXSHAW, ALTA.

**See Bulletin 1054**

## ALLIS-CHALMERS-BULLOCK LIMITED

**Works - MONTREAL**

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# Hydro-Electric Power Commission of Ontario

awarded to the OHIO BRASS CO. the Contract  
for Porcelain Insulators for operation at

## 110,000 Volts

This action was taken only after the most thorough and exhaustive investigations and competitive tests **EVER CONDUCTED** on this Continent. **OTHER MAKES** of Insulators were tested under exactly similar conditions **BUT—**

## O-B HI-Tension Insulators

of the "Suspended" Type were selected simply because they proved to be **THE BEST**.

Insulator Catalogue No. 2 mailed on request. Mention this Adv.

## THE OHIO BRASS CO.

Mansfield, Ohio, U.S.A

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# ANNOUNCEMENT

WE NOW HAVE A LARGE STOCK OF THE CELEBRATED AND RELIABLE

## "Kolloid-Wolfram"

TRADE MARK

### Tungsten Lamps

THE ONLY GENUINE ORIGINAL METALLIC FILAMENT LAMP

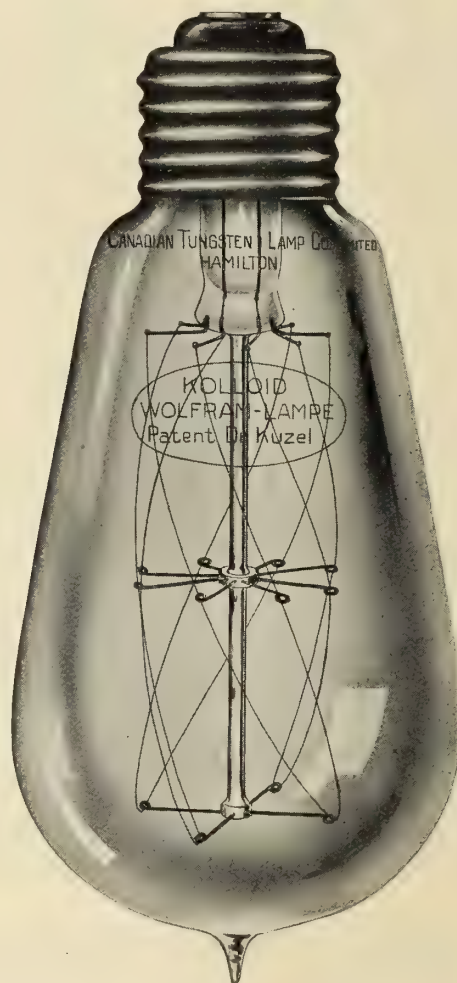
Vast improvements have recently been made in the construction and lasting qualities of our lamps, and to-day they are considered positively the height of perfection in Tungsten Lamps.

Whitest  
Light

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Lowest  
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Saves  
66 2/3%  
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Average  
Life

1000  
Hours

Burns  
Any  
Angle

Alternating  
or Direct  
Current

16, 20, 25, 32, 50, 75, 100 Candle Power, 110, 115, 120 Volts  
32, 50, 75, 100 Candle Power, 225, 250 Volts.

WRITE FOR PRICES

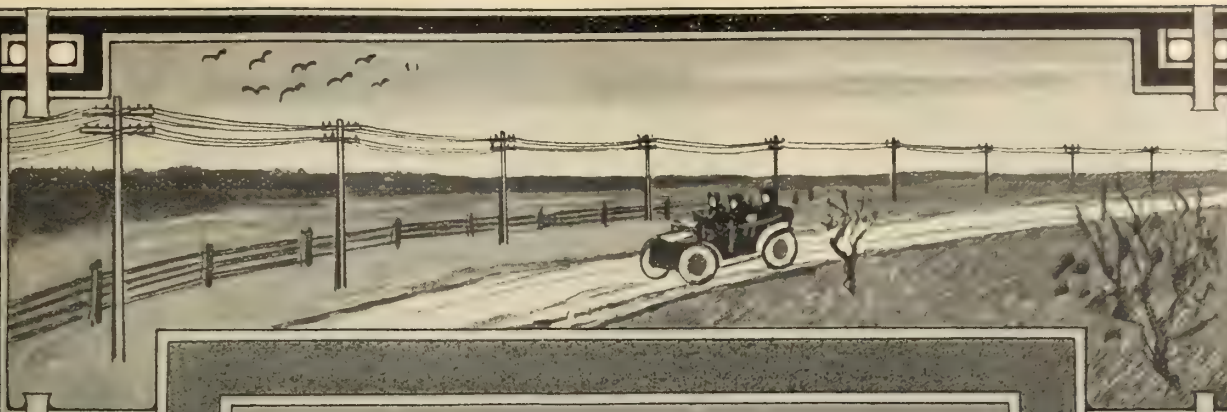
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## The Canadian Tungsten Lamp Co., Limited

Hamilton - Ontario

Operating the ONTARIO LANTERN & LAMP CO., Limited



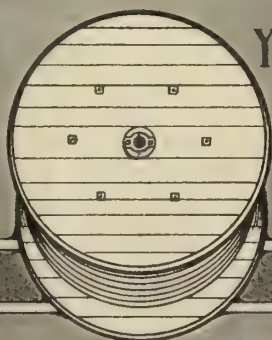


# ELECTRICAL WIRES AND CABLES FOR ALL PURPOSES

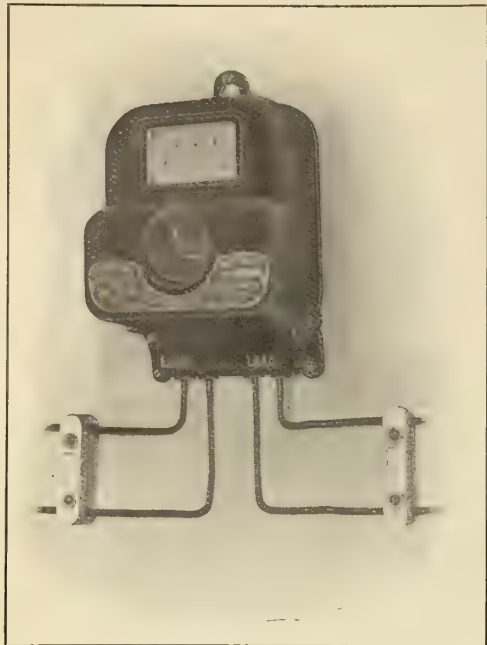
Power Cables, Lead Covered Cables  
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Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
Switchboard Cords, Telephone Cords  
Etc, Etc, Etc,

LET US ESTIMATE ON

YOUR REQUIREMENTS



*The* WIRE & CABLE CO  
HEAD OFFICES . . . MONTREAL



There is good reason for the fact that there are over 30,000

*Packard*

Type "G"

## Integrating Wattmeters

now in use in Canada. You'll find it in the accuracy with which this meter registers the light as well as heavy loads.

By employing the highest class of workmanship in every part of the Packard Meter, and using carefully adjusted ball bearing we have reduced friction to a minimum.

Its sensitiveness and accuracy make it the one meter that can be depended upon to correctly register the light loads of Tungsten and other high efficiency lamps which are now being so generally used.

Write us for more particulars

# The Packard Electric Co., Limited

Head Office and Works:  
St. Catharines, Ont.

Branch Offices:  
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## Canadian Cedar Telegraph, Telephone and Electric Light POLES

All lengths always in stock and shipped direct from our yards in Canada

**J. B. Farwell & Son**  
Main Office - - OSWEGO, N.Y.

## Cedar Poles from "British Columbia"

The strongest, straightest and soundest pole that grows in the "WORLD."

We can ship them East as far as Quebec and compete with Eastern poles-40 ft. and longer.

**In Ontario** we can compete only on 35 ft. poles and longer.

In Manitoba—30 ft. and longer.

In Alberta and Saskatchewan we are "IT" on all lengths.

Don't be afraid of them. They are the leading pole for City and Power line construction.

Yards on C. P. Railroad in British Columbia, Kootenay District.

We name delivered prices **always** and guarantee immediate shipment.

Write for car load prices on our **Oregon Fir Cross-Arms.**

The  
**Lindsley Brothers Company**  
Spokane, Washington

## Fancleve Specialty Co.

Manufacturers of

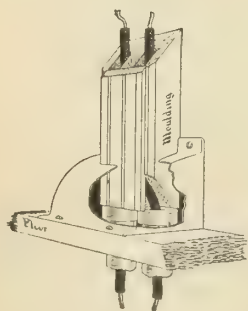
"Fancleve"  
Fittings

for

Electric Conduits, Mouldings  
and Cables

Send Postal for Catalogue

Jamaica Plain, Mass. U.S.A.







TRADE MARK  
Reg. U. S. Patent Office

The Standard  
for Rubber  
Insulation

Okonite  
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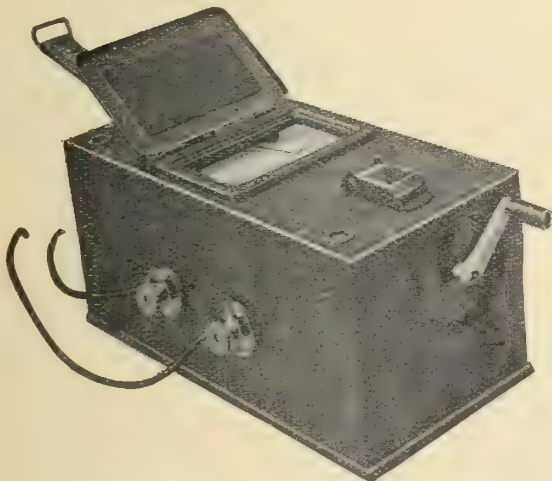
# Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalies. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Candee, President.  
H. Durant Cheever, Treasurer.  
Geo. T. Manson, General Superintendent.  
W. H. Hodgins, Secretary.

The OKONITE COMPANY,  
253 Broadway, NEW YORK, U.S.A.



Abolition of the Old  
Fashioned Jolt Method

which tends to strain  
the Transformer

# THE MEGGER

as used by prominent manufacturing electric companies  
for testing Transformers and for all Insulation Tests

Ranges up to 1,000 volts., 2,000 megohms

Large Stock carried  
in TORONTO by—

**J. F. B. VANDELEUR, Dineen Building**

# A DEMAND

FOR SIMPLE BUT EFFECTIVE

# Electrical Fixtures

has been one of the results of the advent of the

## TUNGSTEN LAMP



Cat. No. 2433.



Cat. No. 2454.



Cat. No. 2450.

The Lines illustrated on this page have been especially designed for this class of illumination.



Cat. No. 2442



Cat. No. 2316



Cat. No. 2453.

The prices are exceedingly low and the popularity of these new designs is a guarantee that they meet the requirements in every way.

Highly Finished and Well Made

Brushed Brass Finish is Standard

# Canadian General Electric Co.

Head Office: Toronto

Limited

Montreal

Halifax

Ottawa

Winnipeg

Rossland

Vancouver



# Pratt Galvanized Stamped Steel Outlet Boxes<sup>and</sup> Covers

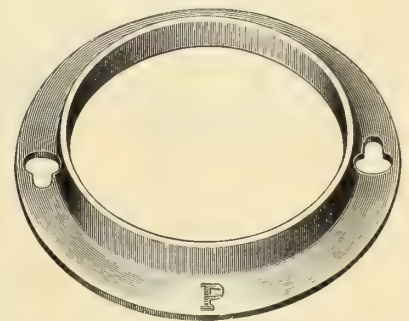
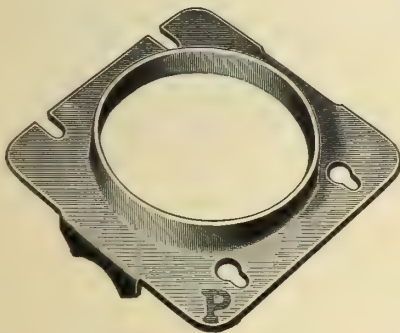
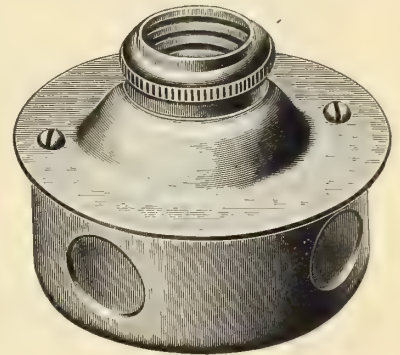
are SUPERIOR Boxes for these Reasons:



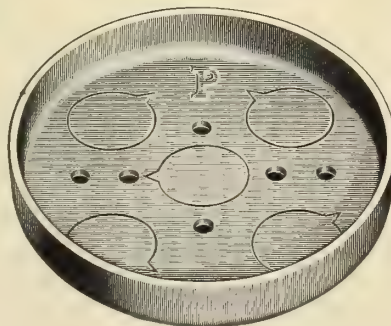
The Electro-Galvanizing ensures a perfect ground.

The Knock Outs are perfect and leave a clean opening.

The Cover is self-adjustable, making the removal of the screws unnecessary.



Consider these money-saving features when you are again in the market for this class of material and specify



## Pratt Boxes

They are unsurpassed.  
A complete line carried in stock.

# Canadian General Electric Co.

Toronto Montreal Halifax Ottawa Winnipeg Rossland Vancouver Limited



Tungsten Post  
Designs No. 1215 J

# Mott's

## Arc Lamp Poles and Electroliers

Catalogue on application  
Special designs submitted

**The J. L. Mott  
Iron Works**

83 Bleury St., MONTREAL

Talk No. 1



**Mr. Contractor :**

You have had trouble with your electrical supplies, that is, parts have been missing.

This has cost you money.

We are handling the "Quality" line of  
**The Duncan Electrical Co.**

Limited, of Montreal

Makers of

## Electrical Supplies

When you send your men out to make an installation with "Quality" goods, you will find your costs are lower, because these goods are what they are supposed to be.

This means something to you.

The

**James Stuart Electric Co., Limited**

Winnipeg, Man.

88 Princess Street

# The Ferranti Meter

This Meter  
is  
doing the work  
to the  
entire satisfaction  
of  
our customers.

Send for Sample.

Western Sales Office:  
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**Geo. A. Powell**  
Manager.  
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Polyphase Type

One User States:—

Out of Seven Hundred Ferranti Meters which we have in use, no trouble or fault has been found with a single meter.

Eliminate your  
meter troubles  
by adopting the  
"Ferranti."

Canadian Branch:  
**Geo. C. Royce**  
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# Engineering Equipment & Supply Co.

13 St. John Street, MONTREAL

**"EXCELLO" Electrical Specialties**  
TRADE MARK

We confine our attention to the following lines:

**Locke "VICTOR" Insulators**  
**"WESTON" Instruments**  
**"HARTMAN" Circuit Breakers**  
**Flame Arc Lamps**



Locke "Victor" Insulators.



"Weston" Instruments.

**Imported Carbons** for Enclosed, Flame and Projection Lamps  
**Incandescent Lamps** Carbon and Metal Filament  
**Transformers** for Low Voltage Tungsten Lamps  
**"JANDUS"** Gyro Fans, Desk and Bracket Fans

**OUR POLICY** is to offer the trade only such products of the world's leading manufacturers as have distinctive merit.

**If You are a Close Buyer get Our Prices**

## Locke Insulator Manufacturing Co. Victor, N. Y.

Montreal Office: Engineering Equipment & Supply Co., 13 St. John Street



"VICTOR"

### In What Class Do You Come?

Class A—Purchase "**Victor**" after the insulators are properly installed, the line is ready for continuous operation.

Class B—Purchase "**As Good as Victor**." The line is ready for operation. Result, intermittent service hence heavy expense for replacements, dissatisfied customers, etc.

**Final Remedy, Discard "Good As?" and Buy VICTOR**

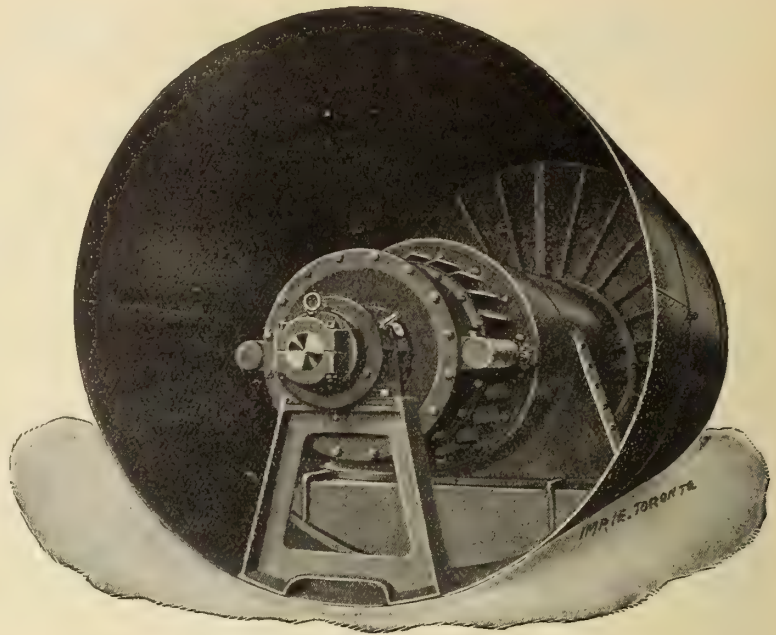
# Hydraulic Turbines

If interested in Water Power development let us tell you about our Improved Turbine.

Built in a wide range of sizes and for any setting.

After studying the conditions we design each installation to give the maximum of power and efficiency.

Bulletin 202 sent on request.



## The Jenckes Machine Co., Limited

Sherbrooke

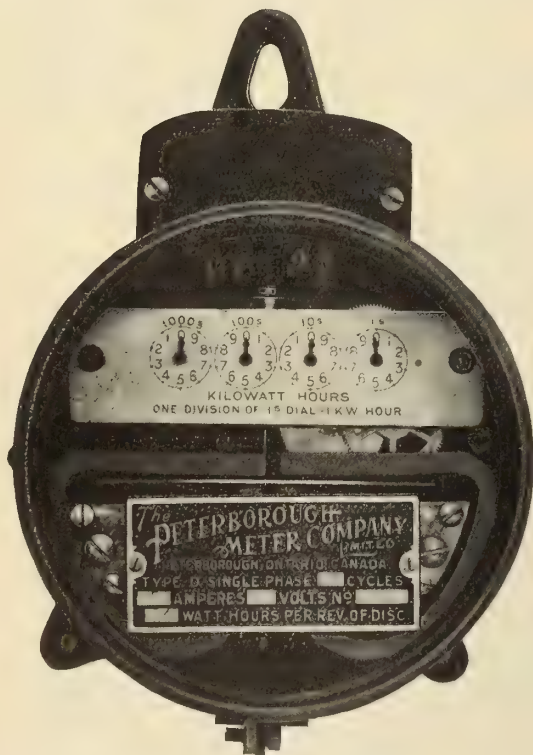
St. Catharines

Cobalt

Vancouver

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Works: Sherbrooke, Que. St. Catharines, Ont.



Can Ship Immediately

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent. overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

# John Forman

Electrical Supplies

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# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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Subscribers are requested to promptly notify the publishers of failure or delay in delivery of the paper.

### EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 8

Toronto, July, 1909

No. 7

## CANADIAN ELECTRICAL ASSOCIATION

### OFFICERS, 1909 10

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A. L. Mudge, Smith, Kerry & Chace, Toronto, Ont.

R. J. Smith, Canadian Electric & Water Power Co., Perth, Ont.

## The C. E. A. and Central Stations

Why are so many central stations not represented at the annual conventions of the Canadian Electrical Association? The logical answer seems to be that only a few of the owners of central stations in Canada are really alive to their own interests. No institution will ever be free from criticism, and some may claim that the Association is at fault. But this claim cannot be substantiated. Those managers, superintendents, engineers, etc., who have been closely identified with the Association are the most enthusiastic in proclaiming its advantages. Not only have benefits accrued to its members, but to the electrical industry at large. The work of the Committee on Inspection and Testing of Meters is alone sufficient to entitle the Association to the support of every lighting and power company in Canada. Last year the abolition of the registration fees, amounting to \$6,000 a year; this year a reduction of \$10,000 in the fees for testing, with promise of a further reduction. What has been done represents the efforts of a few. It should not be so. With the hundreds of commercial stations in this country, a far greater number should be represented in the Association—and larger membership means greater influence and usefulness. Unfortunately, too many owners and directors have not taken advantage of their opportunities. To learn and study the methods of others, with a view of obtaining the maximum result in the operation of their plants, has been but little considered. Their business has been conducted in the ultra-conservative way which is scarcely compatible with the times. Let us hope that the time is drawing near when we will see at the C.E.A. conventions the officials of a far greater number of the lighting and power companies. They will be welcomed into the fold, and their support and influence will be helpful.

## A Question to be Settled

The diversity of opinion existing on the question of secondary circuit grounding is one of the outstanding features at the annual meetings of the various electrical societies of this continent. The committee appointed by the Canadian Electrical Association, in their report which appears elsewhere, favors the grounding of voltages up to 150 volts; beyond that point they leave optional the question of grounding. At last year's convention, the National Electric Light Association adopted the resolution of their committee, which absolutely prohibited grounding above 150 volts. This year this action was rescinded with almost the unanimous support of the convention. Dr. Steinmetz strongly favored the permanent grounding of secondaries without regard to the voltage carried, provided the circuits were well insulated. No decision was arrived at.

Turning to the American Institute of Electrical Engineers, we find this society taking the stand that grounding up to 250 volts is safe and should be permissible.

This wide variance of the different institutions on this question is extremely unfortunate. Our large electrical companies are to-day being forced to suffer and are the losers in all damage actions brought because of accidents due to secondary grounding, directly due to a lack of legislation on this question.

It is to be hoped that during the next year the different electrical institutes may be found working hand in hand towards the solution of this vexed question, and that their decision may be made manifest in an amendment to the code of the National Board of Underwriters.



# The Canadian Electrical Association Convention

**Successful Meeting in the Historic City of Quebec—Interesting Papers and Profitable Discussions—Good Attendance**

The 1909 convention of the Canadian Electrical Association passes into history to be numbered with the successful events in the annals of the Association. From early Wednesday, June 16, when the first rush to register commenced, there was a swing and zest to the proceedings that was very encouraging. Quebec is an ideal convention city and the attendance was well up to expectations.

## Those Who Were Present.

W. N. Ryerson, president Canadian Electrical Association, Duluth.

P. S. Coate, 2nd vice-president Canadian Electrical Association, Chatham, Ont.

T. S. Young, secretary-treasurer Canadian Electrical Association, Toronto.

W. W. Lovell, Westinghouse Company, Toronto.

W. E. Reesor, Light, Heat & Power Co., Lindsay.

A. O. Hunt, London Electric Co., London.

J. M. McLennan, Light, Heat & Power Co., Lindsay.

T. C. D. Wilkes, MacLean Pub. Co., Montreal.

B. F. Anderson, Sunbeam Lamp Co., Toronto.

G. Percy Cole, Allis-Chalmers-Bullock, Montreal.

A. T. Hicks, Trenton Electric & Water Co., Trenton.

L. Burran, Quebec Railway, Light & Power Co.

Edward D. King, Ontario Power Co., Niagara Falls.

H. D. Crouch, Northern Electric & Supply Co., Montreal.

T. Beecroft, Barrie Electric Light Plant.

Geo. C. Rough, the Packard Elec. Co., Ltd., St. Catharines.

C. F. R. Jones, the Wire & Cable Co., Montreal.

S. E. Doane, Cleveland, National Lamp Association.

R. J. Hiller, Canadian General Electric Co., Montreal.

R. J. Smith, Can. Elec. & Water Power Co., Ltd., Perth.

R. G. Black, Toronto Electric Light Co., Toronto.

C. A. Waterous, Waterous Engine Works Co., Brantford.

E. J. Kyle, Merrickville Elec. Light & Power Co., Merrickville.

James Vair, Mayor, Barrie.

F. A. Chisholm, St. Johns Electric Co.

R. F. Pack, Toronto Electric Light Co., Toronto.

H. H. Stannard, com. engineer for G. M. Gest, New York.

L. V. Webber, Toronto Electric Light Co., Toronto.

M. Pellatt, Toronto Electric Light Co., Toronto.

E. Irving, general manager Sunbeam Lamp Co., Toronto.

H. O. Fisk, Peterboro Light & Power Co., Peterboro.

J. F. B. Vandeleur, Brit. Elec. & Machinery Co., Toronto.

W. T. Sutton, Montreal Electric Co., Montreal.

D. P. Burke, Ottawa & Hull Power & Mfg. Co., Ottawa.

W. B. Morrow, Ottawa Electric Co., Ottawa.

Donald S. Barton, Canadian Electric Light Co., Levis.

W. P. Roper, Canadian General Electric Co., Ottawa.

T. D. Lonergan, electric contractor, Quebec.

F. W. Miller, Canadian General Electric Co., Montreal.

C. C. Bothwell, "Canadian Electrical News," Toronto.

E. V. Hennecke, Tungstolier Co., Cleveland.

D. Burnside, "Canadian Electrical News," Montreal.

L. G. Denis, Quebec Jacques-Cartier Elec. Co., Quebec.

T. R. Price, Sunbeam Incandescent Lamp Co., Toronto.

Philip H. Hover, New York Insulated Wire Co., New York.

J. E. Tanguay, Quebec Jacques-Cartier Elec. Co., Quebec.

A. K. McCarthy, Levis County Railway, Levis.

A. P. Doddridge, Quebec Ry. L. & Power Co., Quebec.

W. Bennett, Otis Fensom Elevator Co.

H. G. Nicholls, Canadian General Electric Co., Toronto.

Clarence Thomson, Fred Thomson & Co., Montreal.

John Dorais, Canadian Electric Light Co., Levis.

R. Gambell, Ottawa.

A. L. Mudge, Smith, Kerry & Chace, Toronto.

A. A. Dion, Ottawa Electric Co., Ottawa.

A. C. Towne, Robertson-Cataract Co., Toronto.

E. D. Strickland, National Elec. Lamp Co., Cleveland.

Ralph B. McDonnough, Three Rivers, Que.

Guy M. Gest, conduit engineer and contractor, New York.

Chas. Brandeis, Montreal.

Hugh C. MacLean, Winnipeg.

J. J. Wright, Toronto Electric Light Co., Toronto.

E. J. Phillip, Berlin Light Commissioners.

Hon. L. P. Pelletier, pres. Can. Elec. Light Co., Quebec.

E. A. Evans, Quebec Ry. Light & Power Co.

H. G. V. Farrer, manager Campbellton Electric Light Co., Campbellton, N.B.

Geo. C. Lembke, Petrolia E.L., Heat & P. Co., Petrolia.

D. F. Streb, Electric Light Plant, Collingwood.

J. E. Ryan, Montreal.

E. A. Brough, Nichols Chemical Co., Tweed, Ont.

C. W. Henderson, Montreal.

A. Monet, Montreal.

H. M. Bartlett, supt. Que. Ry., Lt. & P. Co., Quebec.

A. V. Gale, Hull.

Geo. H. Wendt, Can. Westinghouse Co., Montreal.

J. T. Cassels, Quebec R., L. & P. Co., Quebec.

Emile Trudel, Chief of Police, Quebec.

E. W. Galloway, Frontenac Gas Co., Quebec.

N. Buchanan, Quebec Jacques-Cartier Elec. Co., Quebec.

W. Langford, Quebec Ry., L. & P. Co., Quebec.

E. A. Batterton, Quebec "Chronicle."

John Davis, Quebec "Daily Telegraph."

Frank Maguire, Quebec "Chronicle."

C. E. A. Carr, Quebec Gas Co., Quebec.

George C. Knott, Benjamin Electric Co., Chicago.

E. G. Mack, Crouse-Hinds Co., Syracuse, N.Y.

J. E. Davis, Canada Electric Co., Amherst, N.S.

C. C. Starr, Westinghouse Co., Halifax.

A. Sangster, Gas & Electric Department, Sherbrooke.

H. L. Sheppard, Allis-Chalmers-Bullock, Toronto.

D. O. McKinnon, "Canadian Manufacturer, Toronto.

H. P. Kimball, Stand. Underground Cable Co., New York.

Thos. Stewart, Light, Heat & Power Co., Lindsay.

E. Stewart, Light, Heat & Power Co., Lindsay.

L. A. Macdonald, Quebec.

S. G. Chambers, Chambers E. L. & P. Co., Truro, N.S.

J. M. Deagle, Cataract Elec. Co., Orangeville.

G. Hamel, Quebec.

W. F. Dean, Canadian General Electric Co., Toronto.

Wm. A. Bucke, Canadian General Electric Co., Toronto.

A. B. Lambe, Canadian General Electric Co., Toronto.

V. Boyd, Canadian General Electric Co., Toronto.

James M. Nelson jr., Fibre Conduit Co., Orangeburg, N.Y.

J. D. Flavell, Lindsay, Ont.

Wm. McCaffrey, Canadian General Electric Co., Toronto.

E. M. Breed, Allis-Chalmers-Bullock, Vancouver.

J. W. Lachapelle, Eastern Elec. Engineering Co.

L. Grant, British Insulated & Helsby Co., Montreal.

R. B. Hamilton, gen. mgr., Packard E. Co., St. Catharines.

W. H. Reynolds, Eugene F. Philips Elec. Works, Montreal.

S. W. Smith, Engineering Equipment Co., Montreal.

John Warren, Dawson & Co., Montreal.

J. S. Allan, Dawson & Co., Montreal.

James Johnson, Dept. Public Works, Ottawa.

Frank Smallpiece, Can. General Electric Co., Montreal.

R. Dodd, Quebec.

S. J. Belnap, Allis-Chalmers-Bullock, Montreal.

W. E. Rundle, Toronto.

C. F. Medbury, Westinghouse Co., Montreal.

Ed. J. Burroughs, Jacques Cartier-Electric Co., Quebec.

D. Sanford, Jacques Cartier-Electric Co., Quebec.

A. T. F. Harrower, Quebec.

T. F. Dryden, Westinghouse Co., Toronto.

H. E. Blatch, Westinghouse Co., Montreal.

M. Slater, Quebec.

T. F. Teakle, Quebec.

C. A. Jordan, Levis County Railway.

E. D. McCormack, Can. General Electric Co., Toronto.

Wm. P. Flint, Westinghouse Machine Co., Pittsburg.

M. E. Tansey, C.P.R. Co., Quebec.

J. M. Forbes, Alfred Collyer & Co., Montreal.

E. P. Heaton, Canadian Manufacturers' Assn., Toronto.

Thos. J. Mullen, Allis-Chalmers-Bullock, Montreal.

The convention opened on Wednesday morning at 10.30 a.m. in the Association room at the Chateau Frontenac. After a few introductory remarks from the president, Mr. W. N. Ryerson, Sir George Garneau, K.C.M.G., Mayor of Quebec, welcomed the delegates, expressing a wish that their meetings would be pleasant



as well as productive of much good to the Association. At the conclusion of His Worship's remarks the minutes of the previous convention were read by the secretary, Mr. T. S. Young, and confirmed. President Ryerson then read his annual address.

### The President's Address.

"It is with a great deal of pleasure," he said, "that I welcome you to the 19th annual convention of the Canadian Electrical Association. The historic city of Quebec is always interesting to visit, and, although it may be considered by some to be too far east for the majority of our members, its well known attractions at this season of the year, together with the excellent programme prepared for us, should call forth a good attendance. We must realize that our membership extends practically from coast to coast, and no one section of the country can, therefore, claim a monopoly of our conventions.

"Our last meeting in Toronto will be acknowledged to have been epoch making from every point of view, and it is my sincere hope that the papers prepared for you this year at so much expense in time and labor to the writers, will meet with a hearty reception and call forth the discussion which adds so much to their value. Everyone attending our conventions ought to feel that these papers have been written with a view to helping him, but it is only by asking questions and relating his own experiences along the lines set forth that the greatest good to the greatest number can be obtained.

"During the past year committees have been appointed to investigate the following subjects: Grounding of transformer secondaries; meter inspection; central station statistics; theft of electricity.

"The Board of Railway Commissioners for Canada recently drafted new rules governing wires crossing railways. These were submitted to a number of the power companies and to the Canadian Electrical Association with a view to receiving suggestions as to desired amendments. I therefore appointed a Committee consisting of Messrs. A. L. Mudge, Toronto; R. G. Black, Toronto; R. M. Wilson, Montreal; V. G. Converse, Niagara Falls; A. A. Dion, Ottawa; Julian C. Smith, Shawinigan Falls, Que., and P. S. Coate, Chatham, to revise the rules. A special meeting of the Managing Committee was held in Toronto on April 7th, 1909, to receive the report of this committee, at which the secretary was instructed to recommend, on behalf of the association, certain changes in the rules as submitted by the Railway Commissioners. I am pleased to say that the revised set of rules has been forwarded to the association for approval and should probably be discussed at this convention.

"The proposed rules of the Board of Railway Commissioners are all matters of deep interest to members of this association and it is hoped that the reports to be presented by the committees will be full and complete, and will call forth good discussion.

"During the year just passed the depression in electrical industries generally has been marked. As an instance it may be cited that 32.94 miles of electric railways were built in Canada during 1908, the corresponding figure for 1907 being 72.27 miles, a falling off of 54 per cent. Central stations have curtailed their expenses, especially for new construction, but, in spite of the hard times, the majority were able to show good results.

"Western Ontario is shortly to be supplied with electrical energy generated at Niagara Falls. The transmission voltage is to be 110,000, this voltage having been claimed to be in successful operation in the State of Michigan over a comparatively short distance. From an engineering point of view great interest attaches to the use of this comparatively high voltage, but, first cost aside, it is generally admitted that there are no insurmountable obstacles to the use of this pressure, but the final results will be very closely watched. The crucial point in any transmission system is insulation, but insulators must withstand strains of two kinds, electrical and mechanical, and it is admitted that, vectorially speaking, these are 180 degrees apart. Any one familiar with this subject will acknowledge that it is merely a question of time until an insulator combining these two requisites coupled, it is hoped, with a third no less important, that of low first cost, will be developed, but the importance, not to say the necessity, of continuous service makes it particularly hazardous for cities to tie their public utilities, electric railways, lighting and water pumping to the end of transmission lines of the great length and complication necessary in such a scheme as is proposed. It is true that no progress in any art is possible without experience, but mankind is so consti-

tuted that no one cares to be the victim of experiments, preferring to profit by the enterprise of others.

"During this last year a treaty has been concluded between the Canadian and American Governments regulating the use of Niagara power by the two countries. So important a matter as the preservation of Niagara Falls in their scenic aspect is properly a governmental function, as should be the conservation of all natural resources. The present treaty, it is felt, will work no serious hardship to vested interests involved, and the results of its provisions will be watched with interest.

"The North American Conservation Conference, held in Washington, D.C., during the month of February of this year, was participated in by a Canadian commission consisting of the following well known men: Hon. Sydney Fisher, M.P., Minister of Agriculture; Hon. Clifford Sifton, M.P., and H. S. Beland, M.D., M.P.

"The 'Declaration of Principles' drawn up at this conference contains the following significant passages relative to the use of water power: 'We recognize as natural resources all materials available for the use of man as means of life and welfare, including those on the surface of the earth, like the soil and the waters; those below the surface, like the minerals; and those above the surface, like the forests. We agree that these resources should be developed, used, and conserved for the future, in the interests of mankind whose rights and duties to guard and control the natural sources of life and welfare are inherent, perpetual and indefeasible. We agree that those resources which are necessities of life shall be regarded as public utilities, that their ownership entails specific duties to the public, and that as far as possible effective measures should be adopted to guard against monopoly.'

"We recognize the waters as a primary resource, and we regard their use for domestic and municipal supply, irrigation, navigation, and power, as inter-related public uses, and properly subject to public control. We therefore favor the complete and concurrent development of the streams and their sources for every useful purpose to which they may be put.

"We regard the monopoly of waters, and especially the monopoly of water power, as peculiarly threatening. No rights to the use of water powers in streams should hereafter be granted in perpetuity. Each grant should be conditional upon prompt development, continued beneficial use, and the payment of proper compensation to the public for the rights enjoyed; and should be for a definite period only. Such period should be no longer than is required for reasonable safety of investment. The public authority should the right to readjust at stated periods the compensation to the public and to regulate the rates charged, to the end that undue profit or extortion may be prevented.

"Where the construction of works to utilize water has been authorized by public authority and such utilization is necessary for the public welfare, provision should be made for the expropriation of any privately owned land and water rights required for such construction.

"The question of rate regulation is beginning to be talked of in Canada. A public utility bill has been introduced into the Nova Scotia Legislature, and the Board of Railway Commissioners for Canada has been investigating telephone and telegraph rates with a view to ultimately adjusting them. Public service commissions are already established in the States of Massachusetts, New York and Wisconsin, while other States will undoubtedly provide for them in the near future. No public utility corporation honestly and properly conducted need fear the investigation of commissions composed of fair-minded men, and the vital importance of the work will call for the appointment of such men, but it behooves every such corporation in this country to set its house in order, for come they will sooner or later.

"The tungsten lamp has become so well established and has been written and talked about to such an extent as to have become a commonplace. While its introduction has without question worked hardship on some companies in the way of reducing their income, in the end it is bound to be found beneficial if its introduction is carried on under the slogan 'More light for the same money,' rather than 'The same light for less money.'

"It has been urged that this Association should have a representative at the convention of the National Board of Fire Underwriters. This, in the writer's opinion, should be done, and I urge that some action be taken at this convention. The electrical men of Canada should have some voice in the making of the Underwriters' Rules, and it will, without doubt, be found that any earnest suggestion from them will receive respectful consideration on the part of the underwriters.

Before closing I must call your attention to the faith-



fulness and energy of your secretary-treasurer. Nothing, however trivial, which in any way interests the members of this Association is overlooked by him, and we should congratulate ourselves in having so capable an official to care for our interests."

#### The Secretary-Treasurer's Report.

The report of the secretary-treasurer, Mr. T. S. Young, was next read. It stated that the Finance Committee, under the chairmanship of Mr. W. A. Bucke, had obtained contributions to the amount of \$1,065 towards the entertainment expenses of the 1908 conven-



W. N. Ryerson,  
Re-elected President Canadian Electrical Association.

tion, and were able to return to the contributors 27½ per cent. of their donations. Six hundred copies of the proceedings of the Toronto convention were printed and distributed to members and prospective members. The "Question Box" was also printed and distributed as usual. Mr. E. A. Evans, general manager of the Quebec Railway, Light & Power Company, was elected to fill the vacancy on the committee, caused by the resignation Mr. W. A. Pearson, who has removed from Canada.

The report showed that sixty-one new members joined the association during the year, eighteen members resigned, and seventeen names were removed from the membership roll for non-payment of dues and for other causes. The membership on May 31st, 1909, was four hundred and twenty-one, an increase of twenty-six as compared with one year ago.

The membership fees collected during the year totalled \$1,050, an increase of \$105 for the year. The financial statement showed the funds of the association to be \$895.39.

In conclusion, the report contained a suggestion that the men forming the committees be those members of the association who were willing to give their time and ability to advance the general interests of the association. Much of the work fell on the committees, and they should have the assistance and co-operation of every member of the association, not only at the conventions but throughout the entire year. The question of how the best results could be obtained by the committees was worthy of greater consideration by the association.

The auditors' report, certifying to the correctness

of the figures and accounts submitted, was then received and adopted.

The excellent report of the Committee on Meter Inspection was next presented by Mr. A. A. Dion.

#### Report of Committee on Meter Inspection.

Your committee, composed of Messrs. A. A. Dion, Ottawa, chairman; J. J. Wright, Toronto; R. S. Kelsch, Montreal, and A. A. Wright, Renfrew, further considered, since the last general meeting of this Association, carrying into effect the desire of the members for a reduction in the fees charged by the Dominion Government for the verification of electric light meters.

Last year, when a very large deputation interviewed the Prime Minister and the Minister of Inland Revenue, it was admitted that according to the Electric Light Inspection Act the Government could not charge the companies any more than would earn, as nearly as could be, the cost of the service to the Government; but we were told that certain improvements in the service were necessary, that more men were required and better qualified men, to whom it would be necessary to pay larger salaries. We were told that the registration fees exacted from each company and amounting to, from \$10 to \$25, would be abolished at once, and that the verification fees would be reduced as soon as the Government found what its expenses were going to be for the improvements contemplated.

We were told that it would take a year, or thereabouts, to size up the new conditions. Shortly after that interview the registration fees were abolished.

Your committee found it necessary to wait until the financial report for the fiscal year ended March 31st, 1909, was before the Minister of Inland Revenue, before approaching him again on the subject. As soon as possible after the required financial information was available we arranged an interview with the Minister of Inland Revenue for the 14th



P. S. Coate,  
First Vice-President Canadian Electrical Association

of May last. Some members of the committee were prevented from attending, but Messrs. Dion, Kelsch and A. A. Wright met the Minister on the date appointed. After considerable discussion, in which we were told that the Government certainly intended to reduce the fees if that was practicable, but that there were still expenditures to be made which would increase the cost of the service, etc., but your committee pressed hard for something definite that they could bring to the members at this meeting. We refused to be satisfied with anything but a definite answer to our questions, and finally the Minister gave us the following answer, which we find pleasure in laying before you.

He said that on the first of July next reductions would be made in the verification fees of both electric and gas meters,



which reductions would aggregate \$10,000 in a year, and that when reasonable time had elapsed so that the cost of the service which all improvements would be definitely known, further reductions would be made in order that the receipts should as nearly as possible balance the expenditure.

The Minister also stated that he wished to see the service carried out by men having the necessary technical qualifications so that no fault could be found on that score.

Your committee feels that it has reason to be satisfied with the progress made in this matter.

Respectfully submitted,

A. A. DION, Chairman.

The report of the committee composed of Mr. R. S. Kelsch (chairman), and Messrs. Glasco and Chace, on the "Grounding of Transformer Secondaries," was next received. This report and the interesting discussion created by it appear elsewhere in this issue.

The paper prepared by Mr. B. T. McCormick on "Synchronous Motors for the Correction of Power Factor" was read in the writer's absence by Mr. G. P. Cole, and completed the morning's session. This paper and the discussion upon it will appear in a later issue of the "Electrical News."

#### Afternoon Session.

An interesting paper on "Power for Central Stations," prepared by Mr. L. W. Pratt, of the Hamilton Electric Light and Power Company, and read by Mr. A. L. Mudge, Toronto, opened the afternoon session. Mr. Pratt's paper appears on another page of this issue.

Mr. Doane's paper on "The Conservation of Our Natural Resources Through the Use of High Efficiency Lamps," being closely related to the foregoing paper by Mr. Pratt, it was decided to change the order and have it read at this point.

Mr. E. D. Strickland, National Organizer of the Sons of Jove, was introduced to the Convention at this point, and made a plea for that Rejuvenated Order.

A paper entitled "The Small Central Station and its Practical Management," by Mr. R. J. Smith, of the Canadian Electric Water Power Company, Perth, Ont., was next read and was well received. This paper is published elsewhere in this issue.

The next paper was by Mr. R. F. Pack, of the Toronto Electric Light Company, on "Accounting for Electrical Companies." This concluded the Wednesday session. Mr. Pack's paper and the lengthy discussion thereon will appear in a later issue of the "Electrical News."

#### Thursday Morning.

The Thursday morning session was opened by the reading of Professor Herdt's and Mr. J. Dalemont's joint paper on "Electrolytic Lightning Arresters." A lively discussion ensued in which several members took part. This paper is published elsewhere in this issue.

A paper entitled "Considerations Affecting the Choice of Type in Transformers," by Mr. G. Percy Cole, of the Allis-Chalmers-Bullock Company, Montreal, was next read. The subsequent discussion was very interesting and will appear, together with the paper, in a later issue of the "Electrical News."

In presenting the report of the Committee on Statistics, which was the next order of business, the chairman, Mr. W. A. Bucke, pointed out that it was impossible to make a full and accurate report on account of the lack of co-operation from central stations. The Committee could gather information of special value to each manager, but the assistance of the central station men was required. The central stations must also be ready to spend money in putting in recording instruments. The Committee were striving to place the cost of manufacture on a working basis, and to obtain information showing how each department operated. The

majority of managers in Canada did not know how much power they were developing or how much it was costing them per k.w. hour. Mr. Bucke complained that the returns made in several of the cases were extremely unreliable and inaccurate.

In opening the discussion upon this report, President Ryerson pointed out that from the two hundred and fifty forms issued, asking for information, only fifty-one available answers were received. Trade secrets to possible competitors were not revealed in their published reports, but rather central stations received the advantage of comparing their own results with those secured in other places.

Mr. Lambe (Toronto) instanced a case showing the practical value of the information obtained by the Committee on Statistics.

Following this discussion a paper entitled "Questions, Answers and Topical Discussion on Business Getting," was taken up. Mr. Coates, of Chatham, gave



E. A. Evans,

Second Vice-President Canadian Electrical Association.

answers to each of the questions submitted. A general discussion on the questions ensued.

"What plan of campaign would you carry out to secure new business where you have competition from the municipality? What arguments would you use to induce people to trade with you rather than with the municipality, prices being equal, as they would have to be in such a case?"

Mr. Coate: "In answer to this question I would say that the proper course for the private company would be to take particular care that their service is as nearly perfect as possible, and have solicitors advising their customers as to the best possible apparatus to use, and I think when it became generally understood that the private corporation was taking such an interest in its customers as I have indicated they would soon get a large majority of the business."

Mr. Dion (Ottawa) said in part: "We have succeeded remarkably well against competition, due to the fact that we had a large business before, and for many years made it our business to treat our customers with the greatest consideration. During our period of strife with the municipality we thought every hand was raised against us, but after it had all blown over we found that we had a great many friends in the city who said that they had been so well treated by the company that they did not care to change, and this good feeling was our biggest asset—it just shows how it pays in every business to treat your customers well."

Mr. Dion pointed out that a common argument used by



the municipality-owned plant was in the form of an appeal to the civic pride of the citizens—it was the citizens' duty to support the municipal undertaking since, if it failed to make expenses, the amount would be made up out of the taxes. Continuing, Mr. Dion said: "As to arguments to offer to private customers as to why they should support the private company rather than the municipal plant, the only one I can think of is that 'if you are going to turn down the private company and cause its failure, you will have a municipal monopoly, which is far worse than a private monopoly. This because the municipality can do anything and can overcharge you for light as they now do for water, and can use the revenue for other purposes.'"

"When you employ canvassers to secure new business how should they be paid, all salary, all commission, or what portion of salary and what of commission in order to get the best results?"

Mr. Coate: "My own experience is that it pays to employ canvassers on a straight salary, paying particular care that you get good men and that they bring in reports daily or weekly as to what business they are accomplishing. I think in this way the most business will be secured, and probably a better class of men may be obtained than by paying a commission or part commission."

Mr. Dion: "We first paid our canvassers part salary and part commission. At last we tried all three systems—all salary, all commission, and part of each. The system we use now is one of small salaries supplemented by a commission on new business and a lesser commission on renewals of old contracts. Formerly we gave no commission on renewals, but we found that this resulted in our solicitors neglecting them and watching for new business, and we found that we got the best results from the present system of part salary and part commission, with a larger commission on new business and a smaller one on renewals."

Mr. Pack: "There is a drawback on the commission end and that is that the agents show an anxiety to get business that may not be the most profitable. Especially where you have an agency staff I think it is advisable to pay the chief agent part salary and part commission, and the sub-agents straight salary. The chief agent will then see that the sub-agents get the profitable business, and if they do not bring in enough business he will discharge them."

"Where multiple arc lamps are supplied on a flat rate, lamps being owned by the company, is it advisable at the present time to push tungsten clusters, rather than to stock up with arc lamps?"

Mr. Coate: "My answer to this would be that I would not stock up with more arc lamps, but I would insist upon the customer purchasing his own arc lamps in the future, because there is no question but that the tungsten or other high efficiency lamps have come to stay, and if in future the customer were compelled to purchase his own arc lamps he could use his own judgment as to whether or not it would pay to use the tungsten clusters instead of the arc lamps."

"What is the best means of dealing with complaints re high accounts? Should one man be trained to handle these things, and what organization should he have for investigation?"

Mr. Coate: "This is a matter that should be adjusted locally, and would depend upon the size of the place. In the smaller, and even in the larger places, I think it pays to have a man to deal with these complaints, and it is important that such a man should have a special training. It is a very difficult position in every case to deal with complaints as to high accounts, and it is my belief that customers should be treated better than they deserve in this respect. When they complain of high accounts it pays to investigate the complaint very thoroughly, have the matter examined and, if possible, to interest the customer and show him you want to make the account correct. If this is done and your customer is a man of ordinary common sense he will soon see that you are trying to do business fairly and it will satisfy him. But it undoubtedly does take a person of special training to properly look after these matters."

Mr. Lamba (Toronto) felt that this was one of the most important things a central station manager had to deal with and required the best management. He cited a case where a public service corporation was now in continual trouble due to their wrong treatment of one complaint.

Mr. Gamble (Ottawa) and Mr. Doddridge (Quebec) pointed out the fallacy of making reductions on lighting bills unless the customer was entitled to it.

"Do you advocate special rates or flat rates for window and display lighting? If so, would you insist upon a time switch to turn the lights off at certain hours, or let them burn all night?"

Mr. Coate said in part: "In our own case we do allow a special flat rate for window lighting. Our business section is on two main streets of the city and we have natural gas for fuel with gas engines, which produces very cheap power and we allow special flat rates. At ten-thirty each night we send a man out to cut off the window lights. In this way we obtain a larger revenue than we could by the meter rate, and the system is very satisfactory indeed in its working."

"I should think in larger places, where flat rates were charged (and it may be an advantage where power is cheap) it would be well to insist upon a time switch to turn off the lights at a reasonable time rather than to allow them to burn all night."

Mr. Fisk (Peterboro) said: "In our particular case the load is lighter at night than it is during the day when the power load is on. With a water power plant it is sometimes an advantage to have some load on for the sake of regulation, so it makes little difference to us."

Mr. Chisholm: "I should think that this would depend very much upon the size of the contracts and the investment in plant."

Mr. Dion: "I should say that in this connection there is a feature that should not be overlooked. If you have water power and can afford a flat rate for display lighting and can afford to let the windows stay lighted all the evening, you are adding greatly to the appearance of your city or town by giving it brilliantly lighted windows. I have found that giving facilities in this respect tends very much to popularize electric lighting."

"What is the best way to encourage illuminating sign use? Should the company own the signs and rent them, or should the customer buy them on the instalment plan?"

Mr. Coate: "I do not believe it is policy for any central station to buy signs or other installation to encourage lighting, and rent them to customers. I believe these signs should be supplied at cost and special rates given on the meter basis for the current consumed."

Mr. Belnap (Montreal): "With the Chicago Edison Company the custom is to rent the sign lighted complete to the customers at so much per month, and charge for the installation and taking down. They have adopted that scheme with great success, and have much fewer complaints by that system. They have regular inspectors to keep the signs in good shape and in this way by looking after them themselves the general result is much better and a better class of sign is put up."

"In introducing special appliances, heating or otherwise, what do you find the best plan, newspaper advertising, house to house canvassing, or inside demonstration? Which of the three brings the best results?"

Mr. Coate: "In my experience a combination of newspaper advertising is the best way to get this business. In our system of disposing of these electric irons we have a canvasser call upon the people and give the irons out on 30 or 60 days' trial, and call for them at the end. If the purchaser wishes to keep it he pays for it, or returns it if he does not—but it is seldom the irons are returned."

Mr. Webber: "I think in regard to house to house canvassing it is a good scheme to have your meter readers when they call to read the meters enquire in a nice way of the customers whether they have a sewing machine or a flat iron heated by current. In that way they can find who amongst your customers have these things. If this takes too much time for them to cover them all in one month, they might take up one section of the town one month, another section another month and so on, so that in time every consumer on the line would be canvassed."

Mr. Hiller took issue with Mr. Webber on the ground that meter readers as a rule were not properly qualified for this work. Ladies should be employed to demonstrate the different articles to the ladies of the house.

"Does a merchandise department, well equipped show rooms for electric fixtures, shades, etc., help materially in business getting for an electric company? Where the company sells these things it comes in competition and conflict more or less with contractors who aim to get even with the opposition company or municipal plant?"

Mr. Coate: "It is my own opinion that it does pay to keep



a well-equipped show room, for the reason that the operating company is more nearly in touch with the newest apparatus that comes out, and is more interested in their sale. I think the opposition or competition from local contractors amounts to very little. There are comparatively few of them in each place, and I think by all means it does pay a company to keep a department of this kind for the display and sale of electrical appliances."

Mr. Pack: "It is a great mistake for an electric lighting company to sell fixtures. It may, perhaps, be all right to sell special heating appliances, etc., that will encourage the use of electricity all right. But with regular lighting fixtures it is better to rely upon the contractors and make them friends rather than competitors."

Mr. Hiller: "I must take issue with that statement of Mr. Pack's. He is right as far as he goes, but it should be qualified. The principle is all right for large plants such as those in Toronto, Montreal, Winnipeg and Quebec, and maybe Vancouver, but outside these places the principle is absolutely wrong. In small towns up to 25,000 the electric lighting company is the only concern which has the necessary knowledge or facilities for supplying the wants of the people in this line and they should carry an up-to-date stock of shades, etc., to induce more people to use light and more or it."

### The Friday Morning Session.

The result of the election of officers by the executive section, which took place on Thursday afternoon, and resulted as reported elsewhere in this issue, was then read by the secretary-treasurer. Mr. Ryerson announced that the executive had decided to contribute to the Seamen's Fund as an appreciation of the splendid entertainment given to the Association's members and friends, on the "Empress of Britain," by the C.P.R. Company.

### Use of Transformers for General Distribution.

A discussion on the "Use of Transformers for General Distribution" was the next item, Mr. Fisk, of Peterborough opening it by reading his discussion, which was as follows:

#### No. 1.

Ques. No. 1.—Are the majority of your pole transformers core type or shell type? Why?

Ans.—Formerly used shell type but now use core type.

Ques. No. 2.—What general sizes of pole transformers have you adopted?

Ans.—Five, ten and fifteen kilowatt.

Ques. No. 3.—Do you operate them singly, or connected to banks?

Ans.—Mostly in parallel.

Ques. No. 4.—If in banks, do you use special fuses in secondaries so as to cut-off defective transformers?

Ans.—We use no secondary fuses but connect transformer directly to the 3-wire system.

Ques. No. 5.—Do you use a three-wire or two-wire net work, and about how many transformers do you consider safe to install in a net work of this kind?

Ans.—Three-wire net work, 110-220 volts, 100-125 K.W.

Ques. No. 6.—What means do you take to know that the load is distributed between the transformers?

Ans.—Formerly used a Wright Demand meter in transformer primary, but now use a hinged frame current transformer and ammeter by means of which we check up both sides of the secondary of each transformer.

Ques. No. 7.—Do you have any trouble with unbalancing?

Ans.—No.

Ques. No. 8.—Do you ground the neutral point?

Ans.—We do.

Ques. No. 9.—Do you make any tests before the transformer is sent out, or do you accept the manufacturers' tests?

Ans.—We make tests.

Ques. No. 10.—If tests are made, what do they consist of?

Ans.—Test for core loss and temperature rise.

Ques. No. 11.—Do you keep a record of them?

Ans.—Generally.

Ques. No. 12.—Do you make any periodical tests after the transformer is erected on the pole; if so, what do they consist of?

Ans.—Merely inspection.

Ques. No. 13.—Do you make any test of the grounding device? If so, what does it consist of?

Ans.—Merely to inspect the ground wire at the surface of the earth.

Ques. No. 14.—Do you lose many transformers by lightning, and what precautions do you take to prevent it?

Ans.—We lose very few by lightning. We use grounded barb wire on top of the poles, also arresters at power house and various other points on the line.

In addition to this I would like to mention briefly a secondary system which differs somewhat in detail of construction from that usually met with. It consists of a three-wire system, the three wires of which are fastened to the side of the poles 18 inches apart. The lower wire is 19, the centre one 21½, and the top one 23 feet from the pavement. A similar system is constructed on the opposite side of the street and feeders are run across from each transformer. All service wires are connected at right angles to the line. A step ladder 18 feet long, which is handled by two men, is set up on the pavement, from which all the work is done, consequently the service wires are only a little longer than the width of the sidewalk, which in this case is ten feet. The neutral is grounded at each transformer by means of a No. 6 wire stapled to the pole and soldered to a 12-inch x 12-inch copper plate at the foot of the pole. The lightning protection consists of a grounded barb wire as well as arresters at the power house and at various other points on the line. The primary is the usual 2,200-volt 60-cycle, 3-phase system. The primary cutout is the only fuse used. The secondary of each transformer is soldered to the system without fuses, and several of these secondary systems have been in continuous operation without trouble for about twelve years. The advantages of this method of construction are the minimum amount of copper per kilowatt, the ease and rapidity with which connections can be made, and the absence of all pole work after construction work is done, except the addition of an occasional transformer as the growth demands it.

H. O. FISK.

#### No. 2.

Ques. No. 1.—Are the majority of your pole transformers core type or shell type? Why?

Ans.—Half and half.

Ques. No. 2.—What general sizes of pole transformers have you adopted?

Ans.—25-K.W. in ordinary business district.

Ques. No. 3.—Do you operate them singly, or connected to banks?

Singly.

Ques. No. 8.—Do you ground the neutral point?

Ans.—Not our general practise, although it is done at most factories.

Ques. No. 9.—Do you make any tests before the transformer is sent out, or do you accept the manufacturers' tests?

Ans.—Occasionally.

Ques. No. 10.—If tests are made, what do they consist of?

Ans.—Ground to case. Leakage primary to secondary.

Ques. No. 11.—Do you keep a record of them?

Ans.—Yes, of special tests for performance.

Ques. No. 12.—Do you make any periodical tests after the transformer is erected on the pole; if so, what do they consist of?

Ans.—Test for ground.

Ques. No. 13.—Do you make any test of the grounding device? If so, what does it consist of?

Ans.—No.

Ques. No. 14.—Do you lose many transformers by lightning, and what precautions do you take to prevent it?

Ans.—Not many, although lightning is severe. Use pole type Canadian General Electric lightning arresters.

In the discussion following Mr. Fisk's paper, President Ryerson stated that the Edison Company, of Duluth, had found five per cent. of their transformers could be dispensed with through the general use of tungsten lamps. It reduced the revenue but also the all-day core losses.

Mr. Sangster, Sherbrooke: "I use about half and half core and shell type transformers above 15 k.w. for this reason: Sometimes in summer we have 4,000 extra lights at exhibition time, and I can shift the transformers for lighting or power distribution, and that is why I am using the shell type for its usefulness in changing from one work to the other, and I have not found any losses.

In regard to transformer testing Mr. Dion said: "Our practice has been to make tests of sample transformers, say taking one out of each lot to see if the characteristics claimed by the manufacturers are carried out, but, of course, these



tests are not made on all of them. The breakdown test is made on every transformer received from the factory. It is made at 10,000 volts, and I do not consider that it is wise to repeat this test oftener than is necessary because of the down test again it should, I think, be at a lower voltage than the initial test, or is it advisable to make the breakdown test at all?"

Mr. Lambe—"The whole secret is ground your secondaries and you have continuous protection for your customers."

Mr. Black—"I should think it advisable to have a testing set on a waggon to measure leakage of transformer, take the cover off and see that the oil has not leaked out or evaporated, and generally inspect the transformer and test the quality of the oil. We have found that the oil will deteriorate by absorption of water or leakage of water down the wires in some cases. The transformer should also be given a high potential test, and a tap made above the primary fuses so as to energize your testing transformer and have tests from secondary to case, core and primary, and from the primary to the core. It would be advisable to have a set of transformer cards on which would be entered the initial adoption, type of transformer, when got, etc., and keep them entered up so as to keep a record of each individual transformer. The load on the transformer should be taken from time to time with the current transformed. With a split core several men in an automobile or rig could make these tests easily, and you would get much valuable and surprising information from them. I have known men to tackle six transformers, 15 k.w., and get 100 per cent. overload on some of them and practically none at all on others on the same bank, these transformers having been put up by linemen with many years' experience. This was caused by their putting several thousand lights in a building putting the two transformers on the pole nearest the building with several other poles 50 or 60 feet away, and tying them with No. 4-0 copper wire, thinking the distribution would be good. But it was found that two poles had to be erected eight feet apart with light timbers between them and the transformers banked so as to divide the load equally."

Mr. Vandeleur stated that successful resistance tests on high pressure transformers had been made recently in Toronto with a portable instrument. This was European practice, and defects were easily ascertained by this method.

In reply to Mr. Dion's enquiry about the arresters used

in the power house, Mr. Fisk replied that they used the ordinary type of arrester. He further stated that there was more virtue in the barbed wire than in any arrester on the market.

A paper by Mr. Wm. P. Flint on "Gas Engines and Plants," illustrated by lantern slides, was then read and was followed by a paper entitled "Insurers and Insured; Illusions and Delusions," by Mr. E. P. Heaton, of Toronto, manager of the insurance department of the Canadian Manufacturers' Association. This interesting paper concluded the list prepared by the Papers Committee.

The next item on the programme was the discussion of the "Rules of the Railway Commission of Canada Governing Wires Crossing Railways." These rules were submitted to the Association for criticism and the amendments as suggested by them have been adopted. Several members pointed out that the Association had every reason for congratulation on their success and usefulness in having their recommendations carried out. The rules as adopted were satisfactory to central station men and long distance transmission companies.

It was decided to continue for another year the committee on "The Grounding of Transformer Secondaries." The following committees, to be named later, will report at the next convention: "Conservation of Natural Resources," "Uniform Accounting," "Membership," "Standardization of Line Construction," "Statistics," "Matters Relating to the Fire Underwriters" and "The Installation, Care and Testing of Meters."

Before concluding the session a unanimous vote of thanks was recorded to be conveyed to all those who had assisted the Association in making the Quebec convention a success.

It was left to the Managing Committee to select the next meeting place for the Association convention.

## Entertainment Features of the Quebec Convention

### How the Members and their Visitors were Afforded Enjoyment During their Stay in the Ancient Capitol City

The entertainment provided by the local committee for the members of the Association and their guests was a striking feature of the convention. The Committee spared no effort to make the stay of the delegates in Quebec as pleasant as possible, and they were especially considerate of lady guests.

On Wednesday afternoon the ladies were ferried across to Levis, and made a pleasant trip along the river line of the Levis County Railway Company, Mr. A. K. McCarthy, the company's superintendent, and several members of the Social Committee being in charge of the party.

#### Seeing Quebec by Electric Cars.

During the evening the members and their friends made a trip over the electric lines of the Quebec Railway, Light & Power Company. The special cars provided by the company were in charge of Superintendent Bartlett.

#### An Automobile Trip.

While the business session was in progress on Thursday morning the ladies of the party were treated to an automobile ride.

#### The Visit to the Empress of Britain.

In the afternoon, through the courtesy of the Canadian Pacific Railway Company, the delegates and their

guests were invited on board the Royal Mail Steamship "Empress of Britain." The visitors were received at the entrance to the grand saloon, and granted the freedom of the ship by Captain Murray and Commander Walsh, R.N.R., marine superintendent of the company. They were then shown through the ship by the stewards of the vessel.

After the inspection, the party partook of refreshments provided in the saloon. Following this, Commander Walsh welcomed the visitors in a neat speech. He styled his guests the representatives of that power which is to-day showering its benefits upon mankind. Mr. Annable, of the steamship department, and Captain Murray also made brief speeches of welcome. Mr. R. J. Hiller, of Montreal, replied on behalf of the guests.

#### Laval University.

Laval University was thrown open the visiting delegates on Thursday afternoon, and numbers took advantage of this opportunity to inspect this chief French-Canadian university and its excellent museum and library.

#### The Dinner at the Kent House.

The heavy downpour of rain on Thursday evening did not prevent a good attendance at the Association dinner at the Kent House at Montmorency Falls. An elaborate



dinner was served to 150 persons by mine host Baker in his best style, and had the Duke of Kent had looked in upon the gathering his face would have beamed his approval of the proceedings. At the head table, Mr. E. A. Evans, chairman of the local committee, presided, and on his right were Mr. W. N. Ryerson, president of the Canadian Electrical Association, and the Hon. L. P. Pelletier, president of the Canadian Electric Light Company; Mr. A. E. Philp, chief engineer of the S.S. Empress of Britain, and Chief of Police Trudel, of Quebec, sat on his left. At this table were also the officers of the Association.

When the cigars were reached the health of the King was royally proposed and speeches followed by Hon. L. P. Pelletier, Mr. Ryerson and Mr. Evans. The visit to the Rustic Theatre being out of question, entertainment was provided by the guests. Mrs. C. W. Henderson, of Montreal, rendered two songs in excellent voice, and Mr. C. C. Starr, of Halifax, sang "Just Roaming Along." A selection from "The Habitant" by Mr. Geo. C. Rough, Irish stories by Mr. R. J. Hiller, and a recitation by Mr. J. D. Lonergan completed a splendid programme. Music was later provided for dancing.

#### **Ste. Anne de Beaupre.**

On Friday morning the ladies made a trip to the famous shrine at Ste. Anne de Beaupre, and spent some time looking over this historical spot.

#### **The Ice-Breaker "Montcalm."**

Much interest was attached to the trip down the river on Friday afternoon, on board the Dominion Government ice-breaking steamer "Montcalm." A run was made to where the S.S. "Campana" lay caught upon a rock. On the return trip, the R.M.S. "Empress of Britain" was passed, and the following interesting exchange of Marconigrams was effected:

"Captain Murray, 'Empress of Britain':—The Canadian Electrical Association, on board the S.S. 'Montcalm,' extends greetings, and wishes you bon voyage.

(Signed) "W. N. Ryerson, president."

"President Canadian Electrical Association, S.S. 'Montcalm':—The captain, officers and crew, 'Empress of Britain,' send greetings and wish the members of the Canadian Electrical Association a pleasant time in Quebec

(Signed) "Captain Murray."

The weather roughened during the afternoon and the majority of the party took shelter in the cabin. Here the hospitality of the committee awaited the party and refreshments were served.

#### **On Dufferin Terrace.**

While a large number of the delegates left Quebec by the S.S. "Montreal" at six o'clock Friday night, quite a number were present for the band concert at night on the Dufferin Terrace. The music furnished by the Quebec Regimental Band was highly entertaining and a fitting climax to the convention.

#### **The Mechanics' Supply Company's Welcome.**

Not least pleasurable in the entertainment features of the convention was the dainty five o'clock tea, served to their visitors by the Mechanics' Supply Company. During the three days of the convention Mr. Wiggs, the proprietor, and his staff of assistants were kept busy in their handsome showrooms, entertaining the visitors.

#### **The Contributors.**

The Association is indebted to the following companies for contributions towards the entertainment expenses: Waterous Engine Works, Brantford; Standard Under-

ground Cable Company, New York; Canadian Niagara Power Company, Niagara Falls, Ont.; Canadian General Electric Company, Toronto; Hydro-Electric Power Commission of Ontario; Wire & Cable Company, Montreal; Otis Fensom Elevator Company, Toronto; E. Leonard & Sons, London; Hugh C. MacLean, Limited ("Electrical News"); R. E. T. Pringle Company, Montreal; Conduits, Limited, Toronto; Sunbeam Incandescent Lamp Company, Toronto; International Varnish Company, Toronto; Toronto Electric Light Company; Allis-Chalmers-Bullock, Montreal; Canadian Westinghouse Company, Hamilton; Corporation of Quebec; Montreal Light, Heat & Power Company; Imperial Varnish & Color Company, Toronto; Ontario Power Company, Niagara Falls; Dominion Power & Transmission Company, Hamilton.

### **Trade Enquiries**

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the name of the enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

404. Representation.—A north of England firm is prepared to investigate any engineering problems for Canadian manufacturers; also to purchase for, inspect during construction, and test when necessary all classes of machinery, engineering material and supplies.

406. Agent.—A London firm manufacturing motor cars, launches, marine engines, industrial plant, etc., wishes to appoint an agent at Vancouver, B.C.

408. Representatives.—A Lancashire firm manufacturing boiler scale preventative wishes to appoint representatives in Canada.

458. Agent.—A Midlands firm manufacturing small brass fittings, gas brackets and chandeliers, etc., also brass water fittings and electric light accessories, pendants, etc., are open to appoint a Canadian resident agent possessing the necessary connection among buyers.

503. Machinery.—A civil engineer at Sheffield with experience in electrolytic operations for metal recovery is prepared to investigate engineering projects, particularly metallurgical, or to purchase for, inspect, or test machinery or engineering supplies for Canadian firms.

506. Machinery.—A Scottish correspondent would like to get into communication with parties in Canada willing to form a company for the manufacture of certain classes of machinery (steam, electric, hydraulic, etc., hammers, haulage, transporting and hoisting gear, rock drills, air compressors, pumps, turbines, etc.). He would also be open to receive communications from owners of existing works.

512. Agency abroad.—A firm in Glasgow, Scotland, wholesale dealers in engineering supplies and specialties, are anxious to get in touch with a Canadian manufacturer of electric drills, whom they could represent.

486. Electrical goods.—A London firm manufacturing electrical switch gear, measuring instruments and telegraph and signal apparatus, wishes to open up business in Canada.

Many comments of appreciation were heard regarding the handsome pocket books and card cases, distributed to the registered delegates by the Sunbeam Incandescent Lamp Company of Canada, Limited, through their genial manager, Mr. E. Irving, of Toronto.

The Wire & Cable Company, of Montreal, manufacturers of all kinds of wires and cables, presented each of the members in attendance at the convention with a well-bound, 75-page book, containing valuable statistics on the properties of various electrical conductors.



# CONVENTION ECHOES

Three issues of the "Register" were issued by the Association during the convention and were always eagerly sought after by the members. As well as containing an identification index for the numbered buttons issued to the delegates, the Register contained the entertainment features, and a paragraph history of Quebec, and other interesting information.

The Quebec Railway, Light & Power Company very kindly supplied free transportation to the members of the association and their friends. The Bell Telephone Company also furnished a service at the Chateau Frontenac for the convenience of the delegates.

The visitors were at all times made welcome at the power houses of the three operating companies.

The view obtained from Dufferin Terrace after night-fall, looking across to the lights of Levis, is truly magnificent. Standing out prominently is the massive electric sign of the Canadian Electric Light Company, embodying the five letters "C. E. L. Co." The letters are 20 feet high, and each requires the support of two 35-foot poles. The sign is lighted by two 110-volt circuits, and is easily distinguished from the Chateau Frontenac, more than a mile distant.

As the sailors on board the S.S. "Empress of Britain" marched past Captain Murray in single file, each man of the 400 saluted.

The visitors viewed the drills from the boat deck, even taking possession of that sacred spot, the "bridge."

What made the members so shy about speaking on the discussion on gas engines? We thought several were brimming with questions.

When the diminutive bugler of the steamer sounded "Man overboard" the boats were lifted from the davits, launched with remarkable precision, and the supposed victim rescued.

A supposed breach made in the sham collision was quickly repaired by lowering the collision mat.

An attendant at the Kent House describing the old place: "Yes, very few changes have been made around here since the Duke left, these hot water radiators are the same and even the electric lighting system is unchanged." But then, it is only 120 years since the Duke lived there.

The engineering department of the ship naturally came in for a large share of attention from the members, and that genial Scotchman, Mr. Philp, the chief engineer, was held a willing prisoner discussing his beloved engines.

Those members of the Association who enjoyed the hospitality of Captain Murray on board the S.E. "Empress of Britain" will not forget that gentleman's wish, to welcome many of his guests as passengers at a future date.

The Sons of Jove held a rejuvenation at Bennett's Theatre on Wednesday night, and the boys report a good time under the congenial leadership of Mr. E. D. Strickland, the National Organizer, and Mr. W. W. Lovell, Jovian Statesman.

The management of the Royal Muskoka Hotel, Lake Rosseau, Ont., the finest summer hotel in Canada, have invited the association to hold their next convention at

this delightful spot. Attractive rates are offered. As this hotel is conveniently located, being only about five hours from Toronto, the invitation is worthy of serious consideration.

Mr. Harry Shepperd, of Toronto, made an eloquent plea for the employment of ladies in business getting.

The Quebec "cabbie" and his "sliding scale" tariff was not popular with the members. Nor was assistance forthcoming from the cab man at the Chateau Frontenac.

The Canadian Electrical Association numbers in its ranks many sweet voiced comedians, who contributed frequently to the entertainment features.

Mr. Geo. Rough, of St. Catharines, who possesses a wonderful knowledge of Quebec, was official announcer during the trolley ride on Wednesday night.

Returning from the Kent House dinner, "There Are No Flies on Us" was excellently rendered by Mr. Wm. Langford.

There was a keen competition for buttons numbers 13 and 23. Mr. Lewis Burran secured the former, Mr. R. J. Hiller succeeding in landing the skidoo number.

You all heard about the switch?

Everyone wanted to take the trip across on the "Empress," but as the Local Committee had omitted to mention it in the programme, we all arranged to be back for work on Monday.

There was an interesting 50-yard dash at Bonaventure station at 9.01 a.m. on Saturday.

It would make a close race—the "Montcalm" leaving Quebec and the "Montreal" arriving at Montreal. Quebec hospitality? The best ever!

## As Others See Us

Our efforts are always directed towards the continual improvement of the "Electrical News." It is therefore a source of pleasure to find that our work is appreciated by our readers. Below we publish extracts from a few of the letters received at this office from our advertisers and subscribers, who think well of our June number:

"I desire to compliment you upon your June issue of the "Electrical News." We, as Canadians, should be proud of such a publication.

"J. H. WRIGHT,

"Mgr. North Bay Light, Heat & Power Co., Ltd."

"I congratulate you upon the June 'Electrical News,' which is a highly creditable number.

"H. D. BURNETT,

"Peterboro, Ont."

"I must say the 'Canadian Electrical News' is improving. The last number, the Convention Number, is most creditable to all concerned in its get up, both in the matter contained and in the printing.

"A. A. DION, Ottawa."

"We are quite pleased with our advertisement which you had in the 'Electrical News' Convention Number, which we think is quite an attractive edition.

"MECHANICS' SUPPLY CO.,

"Quebec, Que."



# The Small Central Station and its Management

## Methods Suggested for Increasing the Load Factor— The Manager as a Business Man—Handling Complaints\*

By R. J. SMITH

It is not the intention of the writer of this paper to treat the designing or management of a hydro-electric generating station and distributing system in a general way, because that has been done over and over again, but rather to touch on some matters of detail which must be handled every day by the small central station manager.

In plants located in towns with populations of from ten thousand or less the manager must be familiar with every detail of his business. He must be, not only his own engineer, but his own solicitor also, and in a great many cases lacks a technical education which does not tend to smooth his difficulties any. It is easy for a big company with plenty of help and loads of measuring instruments, to run everything fine, but the manager of a small plant is hindered every way by lack of apparatus to make tests, help, etc.

First of all, he must know what his product is costing him to produce and make his rates accordingly, taking into consideration the limited market he has to work in.

The next question which may be asked is, "Will a 24-hour service pay in a small town?" The writer is of the opinion that it will, or rather that it can be made to pay. There is scarcely any small town in which a very fair day-load cannot be secured. If the average man can be shown that it is possible to cut his expenses down, or decrease his manufacturing costs by the use of electric motors, there will be no difficulty in securing his business. Then there are fan motors, electric heating devices, such as smoothing irons and domestic cooking utensils, which are now being placed on the market in a very high state of efficiency and at a moderate cost.

The writer is operating two motors of 56 and 100 k.w. capacity direct-connected to turbine pumps, which supply water to the Perth Waterworks. The 56-k.w. motor is operated continuously, pumping directly into the water mains. The 100-k.w. motor is used for fire purposes only. Almost all small towns have a system of waterworks, and there is no reason why the central station manager cannot secure a very good contract operating turbine waterworks pumps. They are the ideal pumps for such service, whether pumping direct, or into an elevated tank or reservoir. They are now designed for direct connection to either induction or synchronous motors and work very satisfactorily. If an elevated tank or reservoir is used, the pumping may be done during the hours of light load.

### Importance of a Good Service.

Every manager must provide a good and reliable service, continuous and free from interruption, before he can hope to build up a substantial business. Customers' installations must be looked after by the manager to insure their being properly made and maintained. It pays to study every installation, giving the prospective customer the very best advice as to the distribution or arrangement of his lighting. There is no advertisement so cheap and good as a satisfied customer. Above all, create confidence, for confidence is the foundation of new business. The average customer knows nothing at all about electricity or illuminating engineering, and cares only for results. What he wants is the best possible service for the least cost. Who should he look to for advice in the small town, if not to the central station manager?

The writer believes that there is no town too small for a display room. In it there should be a small, well selected stock of fixtures, shades, heating and cooking utensils, which can be demonstrated and explained to customers when paying accounts. Many sales will be made in this way without additional cost. It should be the policy of the company to supply customers with fixtures, shades, etc., at a slight increase on cost, in order to encourage electric lighting. Smoothing irons and cooking utensils should be supplied to customers on 30 days' free trial. If they find that they can get along without them at the end of thirty days, leave them for 30 days more. In nine out of every ten cases you will make a sale. The writer has customers whose meter accounts for the months of July and August read higher than for December and January on account of the use of smoothing irons, cooking utensils, etc. Current is sold during the day at lighting rates.

It is a good plan to have a meter connected to a bank of lamps in your display room, so that you may explain the

operation of the meter to dissatisfied customers. If he sees a meter go slowly on a small candle-power lamp, revolve faster on a number of lamps, and stop when the lamps are turned off, he has a great deal more confidence in the instrument than before it was explained to him. The meter has lost its air of mystery, he knows just how it works and goes away satisfied.

### Handling Complaints.

Every complaint should be immediately and thoroughly investigated by the manager, personally, and in many cases they will be traced to a misunderstanding, which is easily rectified. A special effort should be made to have the customer leave the office in a better state of mind than when he entered, and feeling that he is getting the "square deal" which he is entitled to.

It is the writer's opinion that for a small station it is much better to use only one type and make of meter, and become thoroughly familiar with it, rather than use several types and not know any of them thoroughly. Meter readers are less liable to make mistakes when they have only one style of dial to deal with. Testing and repairs are much easier handled when only one type is used. The writer uses a rotating standard for testing and finds it very convenient. By this method variations in load and voltage may be neglected as both meters are affected alike. Since there are no indicating instruments to read, or stop-watch to be used in timing meter under test, it is possible for one man to do the work which would necessitate two men using indicating instruments. With one type of meter in use it is only necessary to have one rotating standard of the same type and capacity as the meters under test. If of different types, they will have different characteristics, and hence give different registration for the same loads or variations from normal voltage, frequency or temperature. The standard should have several different capacities of series coils; their several capacities corresponding to the capacities of the service meters in use. Ten meters is about the number one man will test in one day.

### Free Lamp Renewals.

The writer is a firm believer in free renewals of burnt-out or blackened carbon filament lamps as a means of giving a good lighting service. It does away with the inferior lamps which will be handled by dealers, if customers have to buy them. In the plant, which the writer has charge of, the consumer buys his first set and is given free renewals in 10 and 16 candle-power carbon filament lamps, for all burnt-out or blackened lamps; the company is the judge of when a lamp is sufficiently blackened to be renewed free. Mechanically broken lamps are not renewable free. The writer has gone even farther along this line, by maintaining Nernst lamps free. He has found that with good regulation, and on a frequency of 133 cycles, the maintenance of Nernst lamps is lower than that of carbon filament lamps.

The use of tungsten lamps has been found very satisfactory, especially in the larger sizes for commercial lighting. Until the tungsten lamp is made more rugged than it is at present it is not very satisfactory for residential lighting.

The writer will make no attempt to go into the matter of rates but simply calls attention to the fact that in making the rate to the consumer, in order to attract the desirable business, the cost of supplying that service should be borne in mind and the long-hour user given a rate which will not be prohibitive. We all realize that a perfect load factor is our ideal, and the better our load factor can be made, the more closely shall we approach success.

The day has arrived when the small station manager has awakened to the fact that business will not come to the office of its own accord, and simply requires to be taken care of. He must get out and hustle to sell his product as any other product is marketed. The writer's experience is that the best results in securing new business are obtained by personal solicitation. The merchant in a well lighted store with tungsten or Nernst lamps is proud of it, and explains to other merchants his reasons for lighting so brilliantly and the benefit he has derived from it, often making the statement that he has the best lighted store in town. This is the kind of rivalry to encourage. Well lighted stores become contagious.

\* Paper read before the Canadian Electrical Association, Quebec Convention.



Jones & Company will not be outdone by their competitors and thus business comes rolling along without much trouble when once the campaign is properly started.

The writer has found that it is a good scheme to take advantage of any pure food shows and made-in-Canada fairs, etc., which may be held in town to secure space for an exhibit of electrical heating and cooking utensils. The managers of such entertainments are usually very glad to have an exhibit, as it adds to the attractions and they will give space free, or for a little electrical decoration. In this way it is possible to get in touch with prospective customers, which could not readily be reached otherwise.

The writer has recently introduced an electric vacuum cleaner outfit which has proven very satisfactory. While it does not consume much current, it is of great convenience to consumers of electric current and tends to popularize the use of electricity. A charge per hour is made for the use of the machine and man to operate. It pays very well and keeps out the city vacuum cleaning machines with their high prices. Accounts for vacuum cleaning are rendered with light accounts without any additional cost. Current used to operate

the machine is paid for at the same rate as lighting. The writer believes in selling "juice," and it does not make any difference whether a consumer uses it to clean house, wash or iron his clothes, cook his food, drive his machinery or light his house, as long as it is sold at a fair rate, and the more that it is used in the daytime, the better he likes it.

In conclusion, the writer wishes to mention a very effectual "ground" which he uses. It consists of an ordinary half-inch brass main cock, tapped into a water main. A No. 4 B. and S. wire is brought down the side of the pole from the lightning arrester or transformer and protected by a piece of iron pipe for about five or six feet above ground. The wire is soldered into the tail piece of the main cock and makes a perfect "ground." Ground wires should not be installed unless they can be connected to a permanent and effectual ground. A ground wire connected to a poor ground not only fails, when it becomes charged, to give the protection for which it is supposed to be installed, but becomes a positive source of danger to the passer-by. The writer can see no reason why an arrangement cannot be made with any water company for the use of such connections.

## Power Rates for Central Stations

BY L. W. PRATT, Hamilton Electric Light & Power Company\*

Much has been said and written during the past few years on the subject of power rates, and the public have been treated, through the daily press, to many learned disquisitions on this subject dealing with load factor, peak load, etc.

All this is, of course, vastly interesting to the central station men with power to sell (or to buy), but I take it that the phase of this subject most interesting to him is the method of marketing his product at the present time and in such quantities as are likely to be required by prospective customers.

It is with a view to placing before you some practical methods of selling power that this paper is presented.

### Flat Rates.

It is not practicable to outline a flat rate schedule of charges for power in large quantities, it being obvious that no two customers will make use of the service in exactly the same way. Consideration must be given to the fact that the marketable value of a product depends not only on what it is worth to the seller, but also on its value to the buyer. The straight flat rate is, therefore, applicable only to the small power user.

The following table is presented for unrestricted power service:

H.P.	Rate per month.	Disc. 10%	Net.	Rate per h.p. per year net.
1/4	2.77	.27	2.50	120
1/2	4.63	.46	4.17	100
1	7.41	.74	6.67	80
2	11.11	1.11	10.00	50
3	13.89	1.39	12.50	50
4	16.67	1.67	15.00	45
5	18.52	1.85	16.67	40
Elevators				30 above 3 h.p.
Church Organ Motors				40 above 1 h.p. or over.

### Meter Rates.

The meter system is by far the most equitable method (when properly worked out) of selling power, both for the central station and the power user. It lends itself when combined with a sliding scale of discounts or table of fixed charges to every variety of power service. A fundamental feature which the small station is sometimes apt to lose sight of is the necessity for a minimum or a "readiness to service" charge, the philosophy of which it is very difficult for the average prospective power buyer to see.

The following scale is used by one of our larger Canadian companies for the sale of A.C. power up to 30 h.p. The consumer is required to pay a minimum charge of \$1.20 per h.p. per month. For one, two and three h.p. the minimum charge is \$50 per annum, or \$4.17 per month.

Column three represents the net rate on the basis of three cents per h.p. hour, column four the rate at four cents, and column five the rate at five cents.

TABLE II.

Hundreds of H.P. hours per month	Discount per cent.	Net at 3c. h.p. hour	Net at 4c. h.p. hour.	Net at 5c. h.p. hour.
1	0	.03	.04	.05
2	7	.0279	.0372	.0465
3	15	.0255	.0340	.0425
4	23	.0231	.0308	.0385
5	30	.021	.0280	.0350
6	35	.0195	.0260	.0325
7	39	.0183	.0244	.0305
8	41	.0177	.0236	.0295
9	43 1/2	.01695	.0226	.02825
10	46	.0162	.0216	.0270
11	48	.0156	.0208	.0260
12	49 1/2	.01515	.0202	.02525
13	51	.0147	.0196	.0245
14	52 1/2	\$.1425	.0190	.02375
15	54	.0138	.0184	.0230
16	55	.0135	.0180	.0225
17	56	.0132	.0176	.0220
18	57	.0129	.0172	.0215
19	58	.0126	.0168	.0210
20	60	.0120	.0160	.02
21	60 3/4	.011775	.0157	.01963
22	61 1/2	.01155	.0152	.01925
23	62 1/2	.01125	.0150	.01875
24	63	.0111	.0148	.0185
25	64	.0108	.0144	.0180
26	65	.0105	.0140	.0175
27	65 1/2	.01035	.0138	.01725
28	66	.0102	.0136	.0170
29	66 1/2	.01005	.0134	.01675

As a tentative suggestion the three per cent. base rate might be profitably given by companies with cheap power development; the four cent rate by smaller water power plants; and the five cent rate by steam plants. This, however, is a matter to be determined by the station manager.

Under the above scale, Table III. shows the net cost per h.p. hour of operating motors from 1 to 10 h.p. running 10 hours per day at full load.

TABLE III.

H.p. of Motor	Discount.	3c. base.	4c. base.	5c. base.
1	7%	.0279	.0372	.0465
2	30	.021	.028	.035
3	39	.0183	.0244	.0305
4	46	.0162	.0216	.0270
5	51	.0147	.0196	.0245
7 1/2	56	.0132	.0176	.0220
10	65	.0105	.0140	.0175

Table IV. gives the cost per month of operating a 10-h.p. motor ten hours per day at varying load factors up to 100 per cent. as well as the corresponding cost per h.p. per year. In practise power customers rarely run over 60 per cent. load factor at 10 hours a day.

\* Paper read before the Canadian Electrical Association, Quebec Convention.



TABLE IV.

Hundreds of H. P. hours per month.	Load factor per cent.	Discount per cent.	Net.	Cost per month.	Cost per h. p. per annum.
1	4			\$12.00	\$14.40 minimum
2	8			12.00	14.40 minimum
3	12			12.00	14.40 minimum
4	15			12.00	14.40 minimum
5	19			12.00	14.40 minimum
6	23			12.00	14.40 minimum
7	27	39	.0183	12.81	15.37
8	31	31	.0177	14.16	16.99
9	35	43½	.01695	15.26	18.31
10	39	46	.0162	16.20	19.44
11	42	48	.0156	17.16	20.59
12	46	49½	.01515	18.18	21.82
13	50	51	.0147	19.11	22.93
14	54	52½	.01425	19.95	23.94
15	57	54	.0138	20.70	24.84
16	61	55	.0135	21.60	25.92
17	65	56	.0132	22.44	26.93
18	69	57	.0129	23.22	27.86
19	73	58	.0126	23.94	28.74
20	77	60	.0120	24.00	28.80
21	81	60¾	.011775	24.73	29.68
22	85	61½	.01155	25.41	30.49
23	88	62½	.01125	25.88	31.06
24	92	63	.0111	26.64	31.97
25	96	64	.0108	27.00	32.40
26	100	65	.0105	27.30	32.76

A very good method of selling power in small quantities is to make a fixed charge per h.p. of motor capacity per month plus a level meter rate. This gives the customer who makes the greatest use of his power service or operates his motor at maximum load factor the minimum unit rate.

For instance, we will suppose the fixed charge to be \$1 h.p. per month and the meter rate 2 cents per h.p. hour. The cost of operating a 10 h.p. motor 1 hour per day would be

Fixed charge 10 h.p. at \$1 = \$10.00

Meter rate 260 h.p. hrs. at 2c = 5.20

at 10 hours per day \$15.20 or 5.73c h.p. hr.

Fixed charge 10 h.p. at \$1 = \$10.00

Meter rate 2,600 h.p. hrs. at 2c = 52.00

\$62.00 or 2.38c h.p. hr.

No. V., the table following, can be used to great advantage in connection with the level meter rate in stimulating long hour use and raising the customer's load factor.

As an illustration, a 10 h.p. motor operating at 60% load factor 10 hours a day—60% of 10 = 6x10 x 26 = 1,560 h.p. hours ÷ capacity of motor = 10 h.p. = 156 hours. On reference to the table 151.7 to 158.8 discount 12%.

TABLE V.

Consumption per month per h.p. of Electrical Capacity installed by Customer.	Discount.
102.3 to 109.4	5
109.4 to 116.4	6
116.4 to 123.5	7
123.5 to 130.5	8
130.5 to 137.6	9
137.6 to 144.7	10
144.7 to 151.7	11
151.7 to 158.8	12
158.8 to 165.8	13
165.8 to 172.9	14
172.9 to 180.0	15
180.0 to 187.0	16
187.0 to 194.1	17
194.1 to 201.1	18
201.1 to 208.2	19
208.2 to 215.2	20
215.2 to 222.3	21
222.3 to 224.7	22
224.7 to 236.4	23
236.4 to 243.5	24
243.5 to 250.5	25
250.5 to 257.6	26
257.6 to 264.7	27
264.7 to 271.7	28
271.7 to 278.8	29
278.8 to 285.8	30
285.8 to 292.9	31
292.9 to 300.0	32
300.00 and up	33

The maximum demand method has not met with much favor in Canada, largely perhaps on account of the unrelia-

bility of maximum demand meters on alternating current circuits of other than unity power factor.

One of the large American companies, however, has recently placed in the market an instrument known as a Poly-phase Maximum Watt Demand Indicator, which is designed to meet all the requirements of alternating current service without regard to fluctuations of voltage and power factor.

Registration is accomplished by means of a single graduated dial and two pointers, one of which indicates the energy passing through the meter at any time. This registration is subject to a correction due to the time lag, which can be adjusted within certain limits. The other pointer is driven by the first and is left at the maximum position reached by it, and is held in place by a ratchet. This second pointer indicates, therefore, the maximum energy which has passed through the device since it was last set.

The Edison Company, of Brooklyn, use an arbitrary rating to determine the maximum demand. Their rates and scale, given below, may prove of interest.

"Ten cents per kilowatt hour for the first 25 hours (or fraction thereof) per month use of the maximum demand.

"Five cents per kilowatt hour for the second 25 hours (or fraction thereof) per month use of the maximum demand.

"Three cents per kilowatt hour for all current furnished in excess of fifty hours per month use of the maximum demand.

"Whenever the portion of the bill, which is figured at 3c. per kilowatt hour, shall exceed

\$ 25, the discount on such portion shall be 5 per cent.

50, the discount on such portion shall be 10 per cent.

150, the discount on such portion shall be 15 per cent.

200, the discount on such portion shall be 20 per cent.

300, the discount on such portion shall be 30 per cent.

400, the discount on such portion shall be 40 per cent.

500, the discount on such portion shall be 45 per cent.

1,000 and over, the discount shall be 50 per cent.

Intermediate discounts shall be determined by interpolation.

"The term 'maximum demand' as used in this contract shall be construed to mean the maximum kilowatts used at any one time during the period covered by a bill for electricity as determined by assuming the maximum demand to be equal to a percentage of the capacity in horse-power of motors installed as indicated by the manufacturer's standard nominal ratings, such percentage varying according to the following schedule:

Installations under 10 h.p. where only one motor is used, 85 per cent.

Installations under 10 h.p. where more than one motor is used, 75 per cent.

Installations from 10 h.p. to 50 h.p., both inclusive, irrespective of number of motors, 65 per cent.

Installations over 50 h.p., irrespective of number of motors, 55 per cent.

"In consideration of the expense incurred by the company in connecting its mains with this equipment and the special rate and terms herein specified, the customer agrees to pay the company each month during the term of this agreement not less than \$1 per month per horse-power, or fraction thereof, in rated capacity of motor or motors connected, such charge, however, to be not less than \$50 per month."

## Exhibits at the Quebec Convention

The opportunity of displaying their goods before the members of the electrical fraternity was not taken advantage of to any great extent at Quebec. Mr. John F. B. Vandeleur, who represents several large British firms in Canada, exhibited a variety of his firms' apparatus. During the exhibition Evershed & Vignole's bridge megger called forth many favorable comments. A navy type combined ammeter and voltmeter and ink and inkless recording instruments made by the same firm were displayed. Mr. Vandeleur also distributed literature covering the different instruments and machines which he handles for the Laurence Scott Company, Evershed & Vignole's, and other English firms.

The exhibit of the Canadian Westinghouse Company, Limited, was very interesting. Mr. Chas. F. Medbury, Montreal representative of the company, was in charge, and displayed an assortment of fan motors of the latest types. A new style 8-inch telephone booth fan that was exhibited should command a ready sale. In arc lamps, both flame and carbon varieties were exhibited. Sewing machine motors and small appliances such as sad-irons and various types of heating apparatus were shown, and proved very interesting to the central station managers and other selling managers.

# Types of Electrolytic Lightning Arresters

## Prevalent Methods of Handling Electric Surges— Liquid Electrode and Aluminum Cell Arresters\*

BY L. A. HERDT, E.E., MA. E. and J. DALEMONT.

The severity and frequency of lightning storms in this country is well known. To protect transmission lines against abnormally high potential induced by atmospheric disturbances different methods have been proposed, and their applications are embodied in numerous types of arrester equipments.

A direct stroke of lightning from the clouds to a transmission line is of rare occurrence, but when such a thing happens, however, the potential at the point struck builds up so rapidly, on account of the slow travel of the electric charge along the wires, that the charge must spill over the nearest insulators to go to ground, or it will puncture the insulators, thus finding its way to the ground. In the above named case, that is, a direct stroke of lightning, arresters are of little use unless, of course, they chance to be placed at the point of the occurrence.

Ordinarily, however, troubles are caused on account of the potential of the line being raised by magnetic induction

arresters. When the potential rises sufficiently to break across the gap arresters, the current in passing through the liquid electrode cell is limited, some experimenters claim, by a counter electromotive force between electrodes and electrolyte; others assign the cause of the limitation of the current to a film of oxide which is formed on the metallic electrodes.

However, as this current passes it throws the electrolyte away from the electrodes, increasing the resistance in the path of the discharge and breaking the arc and also dynamic current, automatically assumes again its level in contact with the electrodes.

In the second type, with an air gap between electrodes and electrolyte, no air gap arresters are required in series, since, after breaking through the gap, the current in passing throws the electrolyte away as previously stated.

Experiments have shown that this action is so rapid that little deformation of the E.M.F. wave of the line takes place, even when the discharge takes place when the E.M.F. is at or near its highest value. This arrester has a well-defined critical voltage; that is, at any lower voltage arcs are suppressed, and, with them, the passage of the dynamic current.

**Aluminum Cell Arrester.** (Fig. 2). This type of arrester is quite different from the preceding one. Mr. Peck, in an article which appeared in the *Journal of the Institution of Electrical Engineers*, Feb. 1908, describes fully one of these.

Aluminum discs, in the form of cups covered with a thin film of oxide, are placed one on top of the other, built up in the form of a column, and are separated by insulating discs or washers. These cups are filled with an electrolyte. (In a

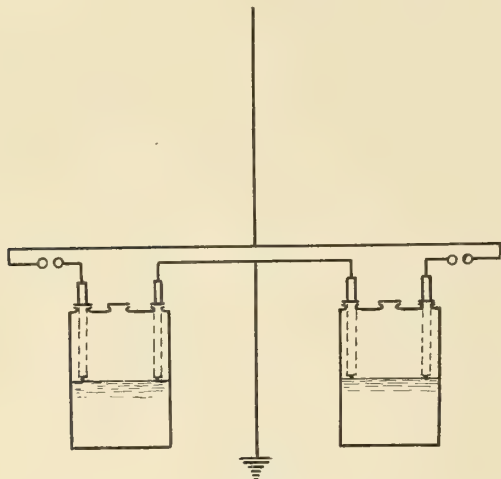


Fig. 1.—Liquid Electrode Arresters.

through atmospheric discharges in the neighborhood of the line, or, again, pressure is electrostatically induced by highly charged clouds in proximity to it. In such cases high frequency currents and continuous currents must be discharged to earth. This is the lightning arrester's duty, that is, it should present a path to earth of lower resistance than that given by the insulators of the transmission line. At the same time, however, it must, after the discharge, oppose the passage of the dynamic current of the line, that is, it must suppress the arc following the discharge.

The multigap arrester and horn-shaped arrester types are well known; they will not be discussed in this paper. Non-arcing multigap arresters, made of material such as copper, zinc, or antimony, have the inconvenience of requiring rising potential at each re-occurrence of the discharges.

Water jets or liquid resistances have been used to provide the path to earth. This type of arrester discharges to earth continuously with a consequent constant loss of energy which at high voltage may mean quite an appreciable loss. In certain countries this type of arrester has built up for itself a good reputation.

### ELECTROLYTIC ARRESTERS.

In a paper presented before the A.I.E.E. in 1907, Mr. Creighton has discussed very fully two types of electrolytic lightning arresters, namely, (1) the liquid electrode arrester, (2) the aluminum cell arrester.

**Liquid Electrode Arrester.**—The liquid electrode arrester, of form shown in Fig. 1, consists of two metallic electrodes, either dipping in an electrode of high conductivity placed in an earthenware vessel or with a small air gap between the electrolyte and the electrodes.

In the first type, that without an air gap between electrodes and electrolyte, the cell is placed in series with air-gap

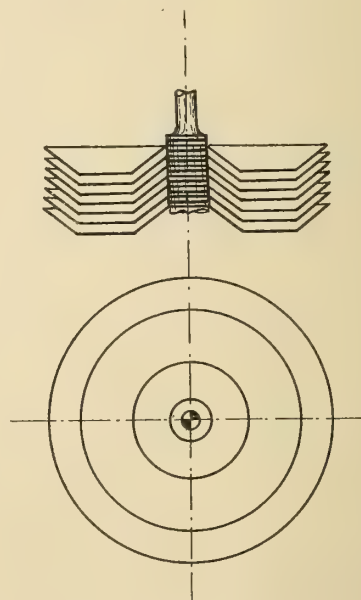


Fig. 2.—Aluminum Cell Arrester.

recent patent it is stated that the electrolyte used consists of an acid solution, either citrate of magnesium or citrate of aluminum.) The whole combination is placed in earthenware jars. On top of the electrolyte a certain amount of insulating oil is placed to avoid the evaporation of the electrolyte. A number of such arresters can be placed in series in case of high line voltages. The critical voltage per disc varies from 380 to 400, depending on the voltage used when the plate formation was made.

With high potential due to static discharge the film of oxide of the aluminum is punctured or pierced through, but when the voltage is again normal the film of oxide is formed again automatically and the arrester is again ready to operate.

Aluminum cells are built from 4,000 volts up. When the line voltage is higher than 13,000 volts or thereabout, multi-

\* Paper read before the Canadian Electrical Association, Quebec Convention.



gap arresters are usually placed in series; for higher voltages, horn gap lightning arresters are used.

It might be of interest to indicate briefly how some of the oxidized plates of aluminum have been formed and under what conditions these plates were found to work.

In a bath containing 6 per cent. of bicarbonate of ammonia two plates of aluminum were used as anodes, whilst a plate of nickel served as cathode. The two aluminum plates were electrically connected together and current was obtained from a storage battery. The film of oxide former on the plates was at first thin, but thicker formations were obtained by increasing slowly and gradually the voltage and again later by lowering it to smaller values than at first used. The ohmic resistance of the film of oxide has been found as high as  $21.0 \times 10^8$  ohms per sq. c.m. It is not constant and diminishes when the applied voltage is increased. The resistance, however, depends on the voltage used when the plates were formed, so that at a given voltage the higher the voltage of formation the larger will the resistance be.

It is interesting to note that in experiments made with such plates used as condensers, after operating continuously for some time the film oxide was found to weaken and to give out in time. It was found necessary in such cases to provide a formation circuit in the shape of direct current to form the oxide film again. In the writer's opinion it would, therefore, seem advisable on account of the above facts to use horn gap or other type of air gap protection in series with this type of arrester, as when placed directly between wire and ground a condenser action must necessarily take place.

Batteries of such electrolytic cells should provide excellent safety valves against line disturbances.

President Ryerson, in introducing the discussion, said in part: "Everyone operating alternating current transmission lines who has given any attention to the subject recognizes that the aluminum cell arrester has formed the first real step toward the solution of the protection problem. The Ontario Power Company were amongst the first to receive these aluminum cell arresters on its 60,000 and 12,000-volt lines and distribution circuits. These arresters were placed on a truss beside a pole with a horn gap in series. They stayed there winter and summer, although the manufacturers told us it would be necessary, in order to keep them in good condition, to discharge them frequently, say once a week. In our case this was not done, but so far as we knew there was no harm done to the arresters.

"We had some serious experiences with these arresters, in one or two instances the plates or pans flashing over, and we lost a number from severe lightning strokes. This, I understand, has been largely overcome by the use of the oil surrounding the plates."

Mr. Lambe: "The electrolytic lightning arrester marks in the arrester field one of the biggest advances probably ever made. It is going to form not an absolutely remedy for lightning, but very close to it. Previous to this, the man who had a heavy lightning stroke on his lines and got off with the complete loss of his arresters only, thought it was easy, but it looks to-day as though he was going to have complete protection, and have his arresters undamaged and ready for another stroke.

"Perhaps some of us do not understand the aluminum arrester very well, and it may be useful to go over part of this paper. The cut shows a section of one; it consists of a number of trays fastened together with gaps between. These are turned upside down with an electrolyte placed between consisting of a secret compound. Borax forms one, and Prof. Herdt speaks of carbonates and bi-carbonate of ammonia, etc. A number of materials may be used to make the electrolyte which work satisfactorily, some of them having various advantages.

"The secret of the whole thing is the film on the aluminum plates, which seems to have infinite resistance to 400 volts per pair of plates, but with a rush of current it will open like the safety valve of a boiler, taking off the charge which has been brought to you by lightning or direct stroke, and it will look after direct stroke and static charges right along.

"They are built for both direct and alternating work, although the most interesting field at present is the high tension alternating. Prof. Herdt speaks of using earthenware jars. They are also built in heavy iron tanks, like boiler plate construction, but that has the advantage of extra weight, size and cost, but it is claimed to have the advantage of being almost indestructible, and perhaps you can say better, it would have the advantage of putting all your live parts into a vessel which could then be thoroughly grounded, and in that way you would have no chance of leaking around a plant where anybody could get into contact with them and get into trouble that way. It is a curious device, but, due to heating,

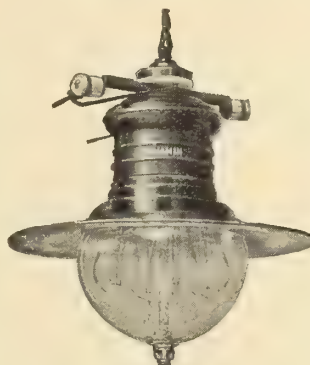
you cannot leave it continuously on the line, because that would involve great size and cost.

"The high tension lightning arrester is accompanied by quite a mass of paraphernalia for keeping the arrester disconnected from the line to protect it from overhang, while leaving it ready to take care of any stroke of lightning, and also for giving the tanks means of forming the arrester. Leave it idle and the oxide film tends to disappear and its resistance goes, and if you put it on the line you may get such a rush of current it may ground and shut down the line and damage it. Consequently all this paraphernalia for charge and discharge make a complicated structure which so far should only go into stations and places where there are attendants, and not on the line.

"The question of temperature arises also. Freezing, while not hurting the arrester, reduces its capacity tremendously, so that while it may be a perfect device in normal temperature it has little capacity for taking the discharge when frozen.

"Just below the critical voltage the ordinary plate takes something like a quarter of an ampere at something up to 300 to 400 volts. As soon as you pass that you get almost instantaneously to a condition where the plate will take something like a thousand amperes with very little rise of voltage, and that means taking almost any charge at all on the line."

## A Weatherproof Tungsten Arc Lamp



Benjamin Weatherproof Tungsten Arc Lamp.

As a substitute for the ordinary carbon or flame arc lamp the Benjamin Weatherproof Tungsten Arc Lamp, manufactured by the Benjamin Electric Manufacturing Company, of Toronto, will appeal to many electrical men. The lamp has a good appearance and is fitted with a 20-inch porcelain-enamelled steel reflector and 12-inch glass ball. Above the former is the body portion, of copper, a metal cross-arm with porcelain knobs, a weatherproof porcelain connecting block, and a suspension loop. The globe may be suspended for cleaning and removing the lamps. An inside reflector of white enamelled steel, with openings for the lamps, assists in the radiation of light. The lamp is made either as a four or five-light cluster. With the former 40 to 100-watt lamps may be used, and 40 and 60 with the latter. The lamp is well ventilated, yet insect proof. In size it is much shorter in body than the ordinary arc lamp.

## Improvement in Trade Conditions

The firm of Fred Thomson & Company report business to be very fair and prospects very encouraging. Recent sales include the following: One 60-k.w. generator, one 45-k.w. motor and switchboard, to the Cascapedia Manufacturing & Trading Company, Little Cascapedia, Que. One 60-k.w. 2,000-volt generator, switchboard and line material, to J. Gordon Dunn, St. Etienne de Beauharnois, Que. One 150-k.w., 1,100-volt generator, exciter and switchboard to W. H. Robert, Beauharnois, Que. One 60-k.w., 2,000-volt generator, exciter, switchboard and line material to U. Archambault, St. Martine, Que. One 300-light, 110-volt generator with switchboard, etc., to the Grand Pabos Lumber Company, Pabos Mills, Que., and a 200-light, 110-volt generator with switchboard, etc., to the Argenteuil Lumber Company, Morin Flats, Que. In these two instances, they are also installing the complete plant, putting up poles, line work and the wiring of the mills and houses.

In the repair line, they are endeavoring to keep you running while they make your repairs, and have recently finished the complete rewinding of the two 550-k.w., 2,200-volt, S.K.C. synchronous motors for the Quebec Railway, Light & Power Company. They have supplied a special electrically operated winch for the Wood Products Company, Donald, Ont.

The engineering department of the National Electric Lamp Association, 4411 Hough avenue, Cleveland, O., are issuing, from time to time, literature of a very interesting nature, dealing with carbon, gem, tantalum and tungsten incandescent lamps. Central station men, dealers and consumers should be in possession of these publications.



# The Grounding of Transformer Secondaries

## Recommendations of the Association's Committee—Discussion on this Interesting Problem\*

The question of grounding transformer secondaries is one of considerable importance to the members of this Association.

The matter of grounding has been discussed by the several Associations and Societies interested in electric light and power work, but, as yet, there is not a definite rule, making it compulsory, such as rules covered by the Canadian and National Fire Underwriters' Association rules. Several recommendations have been submitted to the Underwriters', but lack of uniform opinion by the various institutes has delayed the adoption of a mandatory rule by the Fire Underwriters' Association.

The question of limit of voltage that should be grounded is the principal cause for delay, and is due to the diversity

Use a 1-inch galvanized iron pipe and drive deep enough to be absolutely sure that several feet of the pipe is in moist earth at all times. It is good practice to have the pipe of sufficient length to extend six or seven feet above the ground, as the pipe can be stapled in place with heavy staples, and will be less liable to damage from a waggon wheel or a mischievous boy, than would be the ground wire itself.

Special pains should be taken to see that the ground wire connection to the pipe is absolutely perfect, both mechanically and electrically, so that the driving of the pipe will not disturb the connection.

If either of the above methods cannot be employed and it be necessary to make a ground by deep excavation and ground

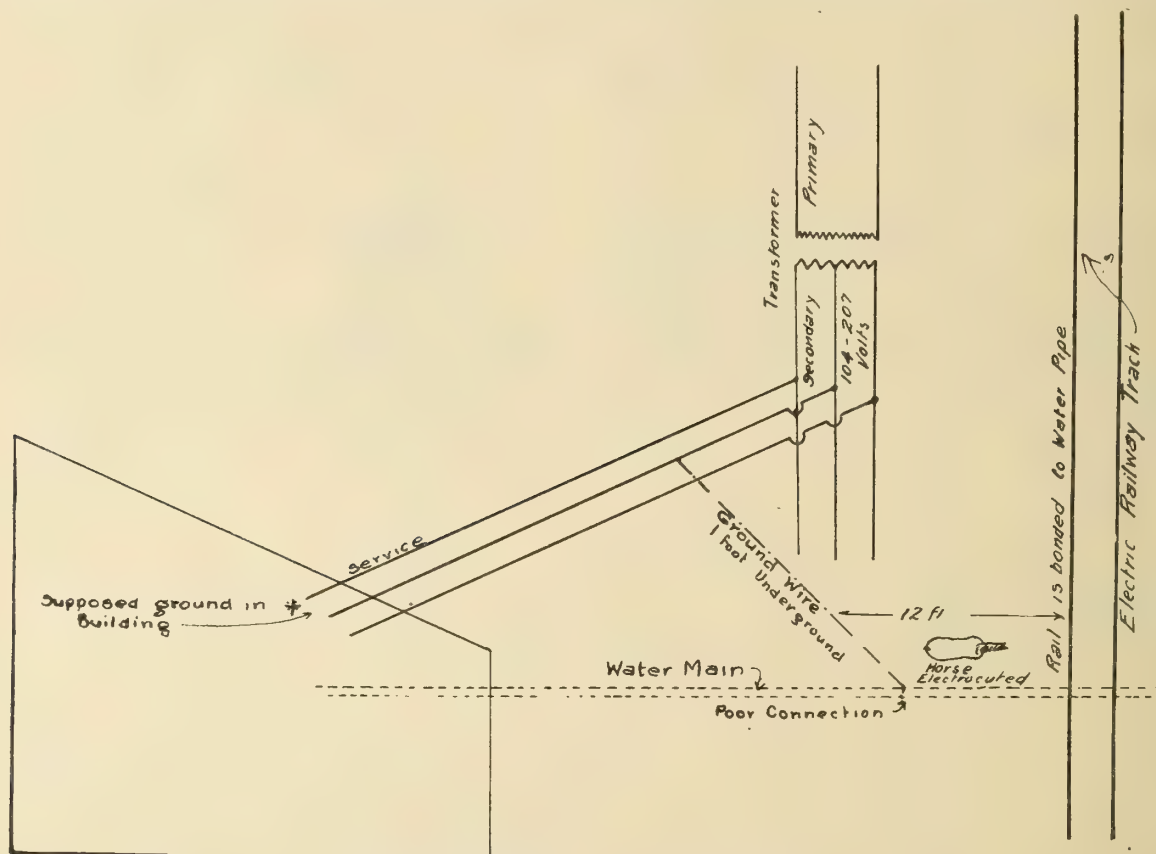


Diagram Showing Poor Secondary Grounding.

of opinion on this point. The method of making the ground and the possibility of danger from poor grounds, and the question of grounding where the wiring of premises connected to the secondaries is in bad condition, have also contributed to the delay in reaching a joint decision.

The consensus of opinion, however, is that secondaries of transformers connected to lighting and other apparatus, and which enter dwellings, shops, factories, etc., should be grounded, and a great many companies are grounding their secondaries and the majority of the larger companies have all their secondaries grounded.

As to the method of making the ground, your Committee recommends using the water mains wherever this is possible. When there are no water mains, or the authorities will not permit using same, your Committee offers the following suggestions for obtaining a ground connection:—

When the water pipe is used, be sure that the ground clamp used to connect to the water pipe is of sufficient strength to permit making a good tight connection; also that the bolt used for clamping is not a common iron bolt which will rust off and allow the connection to become loose.

plate, it is recommended that the ground plate should consist of No. 16 Stubbs gauge copper plate, tinned on both sides and be at least three feet square. The ground wire connection to be made with extra care, both with respect to mechanical and electrical contact. The plate should be buried in fine crushed coke, having at least two feet of coke over and under the plate. A cast iron plate one-half inch thick of the same dimensions may be used.

To make the joint to a cast iron plate, it is recommended that a copper plug be employed, to be screwed into the plate with the ground wire soldered to the plug and the whole thoroughly painted with some heavy asphalt compound to prevent corrosion between the plug and the cast iron plate.

There are on record several instances where the city engineer or other municipal officials have refused to allow the water mains to be used for this purpose—their refusal being due to the fear of damage to the pipes by electrolysis. This is to be regretted inasmuch as it is generally understood that electrolysis does not result from alternating current. There are, we believe, several members of this Association who also operate water works. We would suggest that the members use their influence to assist in educating the water-works engineer and other municipal officials by bringing the

\* Report on Grounding of Transformer Secondaries, by R. S. Kelsch (Chairman of Committee), W. G. Chace and J. G. Glassco, presented at Annual Convention of Canadian Electrical Association, Quebec, June, 1909.



matter before them through the waterworks journal; if there be no such paper, then through the "Canadian Municipal Journal." Also to take such other means as may be found possible to give publicity to the fact that several water companies have allowed the different lighting companies to use the water mains for the purpose of grounding the secondary system of light and power transformers.

Your Committee feels that they cannot say too much on the question of securing a good ground, as a good ground that will remain a good ground at all times throughout the year, is absolutely necessary. A poor ground is liable to do more harm than good.

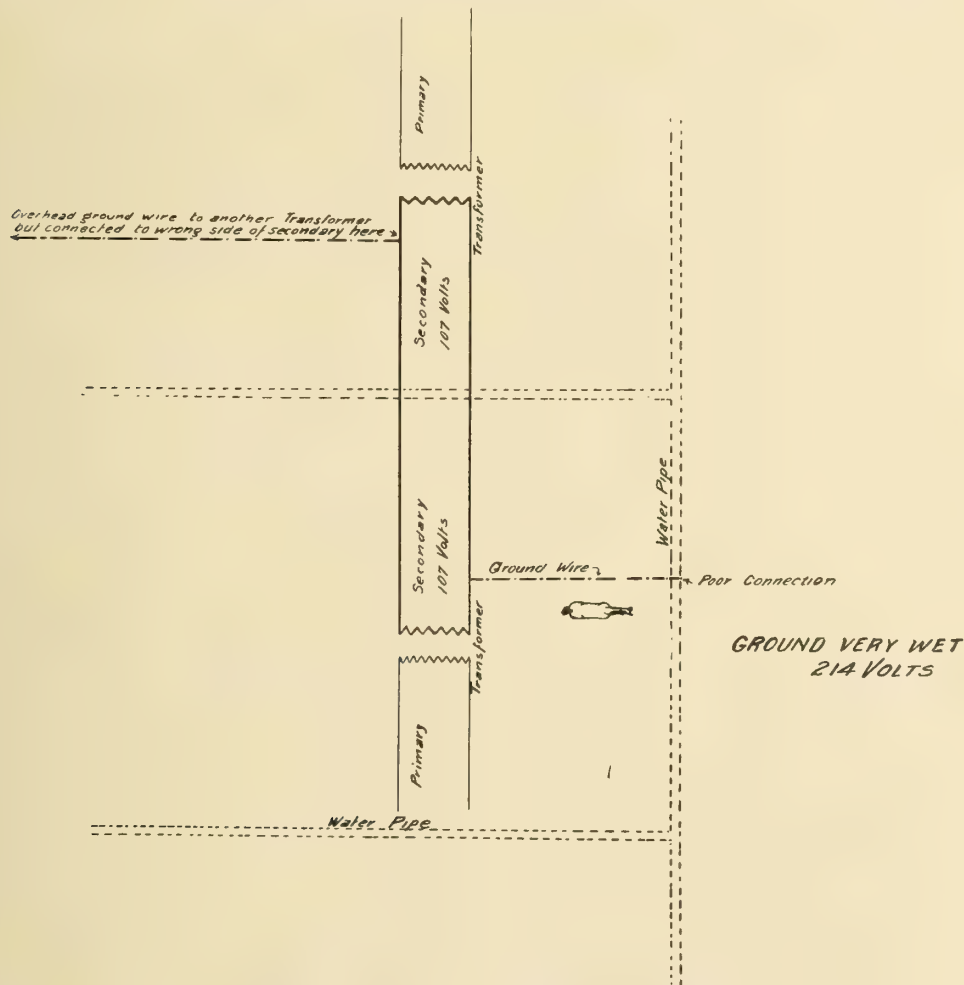
We have reliable information from the general superintendents of large light and power companies that may be well to publish here for the double purpose of giving emphasis to what has been said with respect to the value and necessity of a good ground and as a double warning to those interested.

One company, quite recently, had to pay for a valuable

street parallel to a direct current trolley street car system. The pipes evidently were not driven deep enough, and their use as a ground connection was limited to the moist surface of the ground. During wet weather, and owing to the poor bonding of the street car tracks, a large amount of current escaped to the ground rods; thence to the secondary system and back to the street car tracks again by another ground rod connected to the same secondary. Considerable difficulty might have been experienced if this had not been discovered in due time.

These cases are cited here to show that an absolute ground should be made and be free from stray foreign currents, and should not depend upon the surface of the earth for an earth connection.

There are a few records of reports of deaths said to have resulted from a shock of less than 150 volts alternating current. Few engineers believe that death will result from a voltage less than 150 volts alternating current, and where reports show that death has resulted from a pressure of 150



Another Diagram of Poor Secondary Grounding.

horse killed by the current that escaped from a transformer secondary through a ground wire. The ground wire itself was erected in a proper manner. The street was opened for the purpose of connecting the ground wire to the water mains. The working men employed were unable to locate the water pipe, so they coiled up the end of the ground wire, to which was attached a clamp for fastening to the water pipe, and buried the whole thing, clamp and coil of wire, several feet below the surface of the ground. Ordinarily one would suppose this would be a good ground, especially as the ground was wet and must have been moist at all times lower down.

There were two instances of this kind; in one case the horse was killed and in another case the horse was knocked down but removed before serious damage resulted.

The two instances cited happened in different parts of the city, but practically in the same manner. The two secondaries or grounds which caused the trouble had no connection with each other.

In another instance, a somewhat complicated and unsatisfactory result occurred from two grounds on a secondary network. This secondary system was carried on poles in a

volts, it is intimated that if a closer investigation had been made, they would in all probability have found that there was a more dangerous pressure on the circuit at the time of the accident.

There are, however, a few records of fatal results from 200 volts alternating current and over, and therefore it would seem advisable in every instance to ground the secondary having a pressure of 150 volts, and to leave optional the question of grounding the secondaries having a pressure greater than 150 volts, as a secondary system of 150 volts or more may be installed and operated under conditions that would be important or the danger reduced by grounding the secondaries and making the installation such that a person could not come in contact with the current carrying parts while standing on or in contact with an earth connection. For instance, it may be desirable to ground a 250-volt secondary when the primary pressure is 3,000, 10,000 or greater, or even when the primary pressure be less than 3,000 volts.

As 250 volts would be used for motor service principally, and as the live parts of an alternating current motor are not handled when the current is on, there would be very little

liability of a person receiving a shock of 250 volts, as it would be necessary for the person to be in contact with the earth and to come in contact with the live parts of the 250-volt circuit.

In the event, however, of a breakdown of a transformer or cross between primary and secondary, there would be no possibility of loss of life.

Your Committee recommends that this Association adopt the following resolution, to be presented to the Canadian Fire Underwriters' Association by your Secretary at the earliest opportunity:

Resolved, That the Canadian Fire Underwriters' Association change the rule, relating to the grounding of alternating current secondary circuits, making mandatory the grounding of all alternating current secondary circuits having a pressure of 150 volts or less, and that wherever it is possible, the ground be made to the water mains, which is the safest method of making a ground connection, and which will in no way injure the water pipes, as electrolysis is not present with alternating currents.

Your Committee also recommends that this subject be continued by the appointment of a Committee on the Grounding of Transformers, to make report at the next annual meeting, and, in the meantime, to co-operate with the American Institute of Electrical Engineers and the National Electrical Light Association on the same subject for the purpose of securing the consent of the Underwriters' Association to the insertion of a fixed rule on the subject.

President Ryerson opened the discussion; he had attended the recent N.E.L.A. convention. Their committee had recommended the grounding of secondaries carrying a pressure of 150 volts or less, with the grounding of higher voltages left optional. After a warm discussion their report had been left over for another year.

Mr. Dion said in part: "As far as our company is concerned, we have grounded every transformer to the water pipes, because the city authorities have allowed us to do so, as I think, very wisely. I cannot emphasize too strongly the importance of good grounds, and I would recommend particularly to all companies grounding transformers, the importance of testing the grounds after they are made, and not only immediately after, but again a year after, and possibly every year after, because to our knowledge grounds deteriorate, and are not always made according to instructions. We have discovered cases where workmen, failing to find the water pipe readily, have left the ground wire in the earth and filled in the hole without making connections with the pipe." Continuing, in reply to Mr. Black's query, Mr. Dion stated that their tests of grounds consisted of resistance tests. "Every circuit where the secondaries carry 150 volts or less should be grounded. As to 200 volt-circuits, personally I do not care to ground them, and firmly believe that under certain conditions 200 volts may prove fatal, and would hesitate about grounding them." Mr. Dion further emphasized the necessity of passing legislation upon the grounding of secondaries, so that in damage suits there would be some authority to refer to.

Mr. Phillips (Berlin) advocated the use of a centre tap on the transformer and the grounding of the neutral point. "Educate the people that there is a ground upon the system. Our system in Berlin operates at 500 volts, and the public know there is a permanent ground on the system and keep away from the current on that account."

Mr. Burran (Quebec) enquired if the insurance companies permitted grounding in all cases, and was informed by Mr. Dion that the underwriters allowed grounding up to 150 volts except where current was used for power purposes.

The following Customs rulings have recently been made by the Department of Customs:

Commutator Bars of Copper, cut to form for electrical apparatus, dutiable under tariff item 453, general tariff rate 27½ per cent. Importers at Hamilton were being assessed duty at the rate of 30 per cent., and on an appeal being taken to the Board of Customs against said rate, the above ruling was obtained.

Trolley frogs, held to be dutiable under item 453, general tariff rate, 27½ per cent. This decision was obtained in view of the fact that some collectors of Customs held these articles should be rated for duty as frogs for railways, which contention, it will be observed, was not upheld.

Extracts from Phoenix Fire Office rules, with particular attention to the electrical hazards, are being distributed by Mr. J. F. B. Vandeleur, 3 Dineen building, Toronto, and give some useful information in a concise form.

## A Regenerative Flame Lamp

While new to this continent, the regenerative flame arc lamp has been used abroad for some time and, it is claimed, with considerable success. The lamp produces the characteristic orange ray of the ordinary flame arc, but has a greater intrinsic brilliancy claimed for it. The carbons are placed vertically, one above the other, and enclosed with double globes, inner globe being clear and the outer opalescent. The inner globe cap or top contains an opening, communicating with two side tubes, which allows a free circulation of the gases in the globe, permitting them to return to the bottom of same, also open and on becoming re-heated by the arc repeat the cycle of operations. The chemicals in gaseous form are thereby used over again, intensifying the light and thus giving rise to the name regenerative. Both inner and outer globes are tightly seated both top and bottom to prevent ingress of air. It is designed to eliminate shadows, a decided advantage over many forms of arc lamp. The lamp is operated singly, either on A.C. or D.C., at 110 volts, the voltage at arcs being 70 volts, with a standard current adjustment for 5 amperes. An average life of 70 hours for the carbons are reputed to have been found by tests.

The upper, or negative, electrode, is 18 inches long by ½-inch diameter, and composed principally of pure carbon.

The lower, or positive electrode, which is 7 inches long by ¾-inch diameter, consists of a core or centre, star-shaped in cross section, the radial spaces or grooves being filled with a chemical composition which possesses the property of maintaining a brilliant orange ray independently of the presence of oxygen. The light produced is remarkable for its harmless effect on the eye, steadiness and penetrating qualities. The maximum candle-power of the lamp is 3,400, and is obtained at an angle of 40 degrees from the horizontal and the mean lower spherical candle-power is 2,200. The consumption of the lamp is rated at 550 watts.

Messrs. Fred Thomson & Company, of Montreal, have just completed an electrical oven for comparative baking for the Dominion Government Experimental Farm. They had already built similar ovens for the Ogilvie Milling Company, of Montreal; the Ontario Department of Agriculture, and for several firms in the United States.

The Benjamin Electric Manufacturing Company, Toronto, upon request will mail their new Tungsten Bulletin No. 4.

An interesting description of the methods employed by the Metropolitan Railway of Paris forms the leading article in the second quarterly issue of "Reactions," published by the Goldschmidt Thermit Company, New York.

Compensators for A.C. Circuits.—An instrument which corrects the voltmeter indication for the drop of potential between the source of supply and the point of consumption, is described in Circular No. 1026, issued by the Canadian Westinghouse Company, Limited, Hamilton.

The quarterly report from Verity's, Limited, electrical engineers and manufacturers, 32 King street, Covent Garden, London, W.C., contains much of interest to electrical men. The report deals with isolated electric light plant outfits, the Aston Metalamp, flame arc lamps, automatic contact gears, and winches.

Some very original literature was distributed at the Convention by the Tungstolier Company, of Toronto, and called forth many laudatory remarks. Their different booklets include many creditable designs and color schemes that reflect credit upon the originators. The "Illuminator," a monthly publication of the Tungstolier Company, is an interesting and breezy magazine.

"Brill's Magazine," under date of June 15, contains a continuation of the series of articles describing in a general way the standard type of car used on many of the electric tramway systems in various large cities throughout the world. The leading article in this issue deals with London, Eng., cars. The magazine is well illustrated and is distributed by the J. G. Brill Company, of Philadelphia.

"The Wail of the Tungsten" is the title of a booklet written in lighter vein and conveying a moral showing the necessity for employing suitable fixtures with the tungsten lamp. It was distributed by the Tungstolier Company, of Cleveland, at the N.E.L.A. convention. This company also issued a novel and artistic folder showing on four lamp-shaped panels the luminaries, the sun, moon, stars and the Tungstolier.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Question No. 1.—Can you suggest a practical method of locating a grounded armature coil in a three-phase revolving field type generator where the ground is not recorded by a detector until the voltage comes very near the normal?

Answer.—Assuming you are positive the ground is in the armature, and not on the line or in the cabling in the power house, the easiest method of locating the trouble is by burning it out. This, of course, will only hold if you have an a. c. system of both 110 and 220 and 1,100 or 2,200 volts. First disconnect the leads at the machine running to the switchboard. Then connect the high voltage side of any small transformer to the proper voltage in the power house, and one lead on the low tension side to the frame of the grounded generator and the other lead to the winding. Use a double pole switch and small fuse in the low potential side of the transformer, close the switch, and the fuse will probably blow, a flash showing at the point where the armature winding is grounded. This operation may be repeated until the fault is definitely located, but care must be taken not to burn the insulation too much. If you are not successful in locating the ground by this method, connect the low potential side of the transformer to its proper voltage, with the switch and a small fuse in circuit. Connect the high tension side for 1,100 volts, and attach one lead to the frame and the other to the winding. If this does not locate the fault change the connection and give 2,200 volts. If the fuse does not blow and the fault cannot be found it is very trifling and negligible. It is assumed that you wish to locate the ground with the idea of making immediate repairs. If the grounded machine is the only one available you may use the exciter with very small fuses. If a magneto will ring through the ground, one section of the winding can be separated at a time and tried, and should show a ground, then subdivided again and tried again, and so on until the fault is located.

Question No. 2.—In the case where telephone wires are carried on poles with high tension transmission lines what methods of protection from lightning and to the operator are adopted?

Answer.—(1) Protection from lightning — Nothing can be done on the line itself, the terminals are the best point for the application of protective apparatus. A device consisting of a fuse and a small lightning arrester of the ordinary telephone type is usually used. The fuse is of the enclosed type and made for a voltage corresponding to that carried on the transmission line; it should have a very small current capacity. The lightning arrester usually consists of two little carbon blocks,

pressed together by springs and just separated by a thin sheet of mica with several holes in it. This arrester discharges very easily. The device should be connected with the mica between the line and the arrester. This will be a serviceable protection in case the telephone lines become grounded on the high tension circuit.

(2) Protection to the operator.—To insure safety to the operator from the heavy line voltage, the telephone in the sub-station or the power house, as it may be, takes a rather unique form. That in use by many of the large Canadian companies consists of an especially designed megaphone transmitter and receiver. The operator steps to a well insulated platform and gets his connection by turning the handle of a wheel which is well insulated from the line. This gives him the connection and he then delivers his message into a megaphone-like transmitter and his answer comes through a similarly shaped receiver. There is absolutely no danger in this method to the operator no matter how great the line voltage.

Question No. 3.—Can you outline for me a method of obtaining the internal resistance of a storage battery?

Answer.—First measure accurately the voltage of the battery on open circuit. Then connect a load across the battery terminals with an ammeter in circuit. Take simultaneous readings of voltmeter and ammeter, being sure of their accuracy. The second voltmeter reading will be slightly lower than the first. Now apply Ohms Law where  $R$ , the internal resistance of the battery, is equal to  $E$ , the difference between the first and second readings of the voltmeter, over  $C$ , the current shown by the ammeter. This test should be made when the battery has neither been recently charged or discharged, and to eliminate errors due to polarization the readings should be taken as quickly as possible.

Question No. 4.—In figuring the efficiency of an alternating current generator where it is excited by a separate direct current exciter, what allowance is made for the exciting current?

Answer.—If the efficiency test covers the alternator only, the watts in-put of the field is charged up as one of the losses, this in-put being measured by voltmeter and ammeter connected right at the field terminals. This test will not include the generator field rheostat nor the exciter itself, nor yet the exciter field rheostat. When the efficiency of an alternator is spoken of, a test as above is the basis of measurement. Where the "combined" efficiency of the machine and auxiliary apparatus is specified, all the losses mentioned above are to be included. If the exciter be driven by belt from the alternator shaft, the belt losses should be included. If driven by motor the motor loss should be taken in. If driven by a steam engine the equivalent in watts of the indicated horse-power should be charged against the alternator. This "combined" test, however, is rarely called for.

The manager of the Haslingden, Eng., Corporation Tramway has patented an invention which does away with soldering in the suspension of the lines. A special tool grooves and flanges the wire at any required point, and the wire is then clipped by a grooved and flanged metal holder, which is made in halves so as to permit of being secured by countersunk screws. The invention does away with the risk of weakening a line by soldering, with resultant risks of fusing. It also eliminates the danger from wires falling from insecurity of soldering



# Progress of Engineering Practice in England

By J. F. B. Vandeleur — Being a Description of the most recent Electrical Devices in use on the continent \*

A modern invention which I had my attention drawn to while in Europe is what is termed an inkless combined feeder log which has been adopted by electrical departments of Glasgow and several other corporations. One can obtain simultaneous readings of watts and frequency, volts and amperes, power factor and frequency, etc. Absolute synchronism and accuracy of time contracts is thereby obtained. An inkless recording meter, as the name designates, is a meter which records without the use of ink or pen, the chart being formed by series of contacts made over a typewriter ribbon, the contact impulse being actuated from a control clock which can give an impression every second and as close as 1-760th part of an inch apart, thus forming a continuous line. The most modern switchboards are now designed with these recorders and it is a matter of interest to note that frequently as many as six or seven instruments are governed by one master control clock.

## Protected Switches.

The stringent rules which have been enforced by the British Board of Trade have resulted in the demand for "Fool-proof" apparatus being met by rather elaborate product now placed on the market by several prominent manufacturers. This is exemplified by the life and fire saving devices which are now used for enclosing the live contact parts of switches, fuses and terminals. A modern switch for low tension work in its outward appearance would merely indicate a metal box with a plunger knob attached in the centre of the face thereof. However, it will be noticed that it is impossible to open the box to make an inspection of the switch and fuses unless the plunger has been withdrawn, thereby interrupting the circuit, and it is also impossible to close the switch box lid when the plunger is on the "in" position, thus making sure that short circuits are impossible from the carelessness of the operator. Every switch used in the Franco-British Exposition in London last year was of this character.

## Equipment of Submarines.

Certain difficulties are inherent in the operation of submarines. The driving mechanism entails the use of a petrol engine, dynamo, motor and storage batteries and quite a complicated switchboard. It is obvious that the most economical method in which a submarine can be driven through the water when running in a half-submerged state is to drive the propeller shaft by an oil combustion engine. This engine at the same time has capacity to operate a dynamo, which, in turn, charges the storage batteries. In order to obtain the maximum output of the generator with the minimum amount of material it has been found advisable to construct the machine of steel of high magnetic permeability; thus a greater capacity is obtained from the same dimensions of a generator that is ordinarily used for land service. When the commanding officer of the submarine desires to direct his boat below the surface the petrol engine is thrown out by a clutch and a change-over switch throws the motor, which is directly attached to the propeller

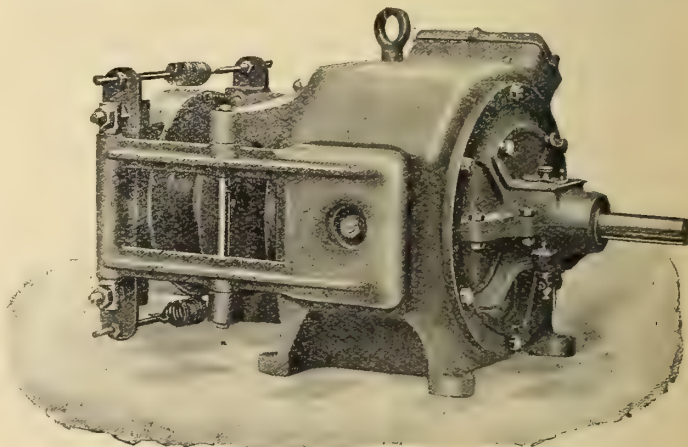
shaft, into operation. This motor, of course, is operated from the storage batteries before mentioned. The complete elimination of sparking is absolutely necessary, since the electrical apparatus is most rigidly tested before acceptance by the authorities.

## Arc Lighting.

Reverting to the electrical illuminating advancement. The latest development in arc lamps is the use of a single enclosing opalescent globe having a diameter not greater than 7-inch, which is a maximum amount of air in which an arc can be struck satisfactorily. Most of the towns in England are being lighted by flame arcs, which appears to be the only satisfactory method of lighting streets. Frequencies of 25 cycles are used now to operate flame arc lamps, the lamps being suspended in the neighborhood of 25 feet from the ground. A slight amount of flickering is noticeable. A lamp has not yet been designed which will operate satisfactorily on a circuit of this frequency for enclosed spaces.

## New Motor Brake.

The use of the electric motor for operation of winches on board ships, dockyards, etc., was not complete with-



Motor Equipped with Scott Brake.

out a specially designed brake which would allow for a rapid starting, stopping and reversing. Various types have been produced, but it remained for a member of the British Institute of Electrical Engineers, by the name of Scott, to produce a brake which in its simplicity and absolute reliability, is probably many years in advance in the design of other brakes. The magnetism developed in the motor itself is utilized for actuating the brake gear without interfering in any way, with the mechanical simplicity and strength of the motor itself. A gap or a partial gap in the magnetic circuit at the root of the two pole pieces is made, so that lines of force pass across the gap and through the brake flappers, which are thus attracted. The brake is made of cast or wrought steel and the brakes used are easily adjustable for wear. These shoes are controlled by two springs, which are in parallel. Apparently the springs are designed with a large factor of safety and appear to work well within their elastic limits, as they are large for the work they have to do. However, it will be seen that a dashpot is entirely un-

\*Abstracts from a paper read before the Engineer's Club, of Toronto.



necessary and wound coils are not used in any way, as they are also unnecessary. The use of this brake affects the magnetic reluctance of the magnetic circuit to a very small degree and I have seen a motor thus affected operate at the same speed and give the same rated output at the same temperature with the brake as without.

The starting current is not increased because the brake flappers are attracted with much less than the full load current, and the slight extra reluctance of the circuit when the brakes are partly "on" at a light load only involves a little greater speed, which is rather an advantage than otherwise. These brakes are designed to operate on series direct current motors just as well as shunt wound machines.

### Electrical Ore Finder.

The system is based on the discovery made by Sir William Preece, some twenty years ago, who, when experimenting with wireless telegraphy, energized the earth with an interrupted current of low potential, and found, by means of a telephone circuit connected to earth with portable electrodes, that the geological conditions of the earth's crust, through which his currents were flowing, altered the shape and changed the intensity of his field.

The instruments used are of special design, and a great deal of money has been expended in perfecting them, some forty different types of instruments having been designed and tested continually at various mines. The whole apparatus is portable, and can be carried by two men. It consists of: (1) A portable battery, which will supply sufficient current for about 14 hours' working, and is then recharged; (2) a transmitting apparatus made in two sizes, of which the following is a description of the smaller size used at Coniston: It consists of an induction coil adapted to deliver, when required, a very heavy secondary charge into a condenser, resulting in 40,000-50,000 volts, from which wires connect to portable electrodes, having a spark-gap—in series or in parallel—inserted in circuit, which is completed by the earth. This spark gap is used in series to intensify, or in parallel to prevent burning; (3) the receiving circuit, consisting of two telephone receivers, each of 500 to 900 ohms resistance, connected to the exploring electrodes (steel rods about 24 inches long), through a series parallel switch. These telephone receivers are constructed to respond to tuned waves and can be varied at will.

The extent of the field to be explored, in which operations can be conducted, without shifting the transmitting apparatus, is almost illimitable, depending entirely on the size of the apparatus used. The earth can be energized for a radius of many miles, but, owing to the portability of the apparatus, it is obviously in most cases, preferable to move it about than to employ larger and more expensive instruments, which would be required to energize a larger field.

On earthing the transmitting electrodes, usually about 100 yards apart, a field of force is created in the earth's crust something similar to an exaggerated field of force from a large horseshoe magnet. With a suitable amount of condenser in action and proper adjustment of the spark gaps, the telephones, connected to the receiving electrodes immersed in the earth from 20 to 70 feet apart, give an audible note at least a mile away. Variations in lines of flow will be caused by underground deposits of metalliferous bodies. Lodes are electrically divided into two classes, those which are better conductors than the enclosing rock, and those which are, comparatively speaking, insulators. A good conducting lode changes the shape and intensity of the normal field, elongating it in the direction of the strike. Waves are

brought to the surface by the lode, and there is a concentration of energy over the apex of the lode, and a corresponding increase in sound. When, however, the receiving electrodes are equi-distant from the apex of the lode, a point of equi-potential is reached, and a marked diminution in sound occurs, if not absolute silence, which, to the untrained operator, it appears to be.

To locate an outcrop covered by a few feet of subsoil: The transmitting electrodes are placed in the ground in a line at strike of the lodes. Two operators, each holding a phone, proceed, at a few paces apart, cross the field to be tested in a line parallel to the transmitting electrodes. The receiving electrodes are thrust a few inches into the subsoil, taking care to make a good contact, and the sounds heard are noted. On approaching a metalliferous lode the sounds are intensified, and the operators then come closer together, and proceed more cautiously, only moving electrodes a foot or so at a time, until silence is obtained. A post is then planted in the ground midway between the electrodes, and this post represents the apex of the lode, or the spot under which the metalliferous body will be found. In the case of an insulated lode, such as a quartz reef, the sound will be most intense over the apex of the lode. The method adopted in this case is to earth the transmitting electrodes in a line parallel to the strike of the lode, when the waves in the centre of the field travel in a parallel direction, and if the apex of the lode is not too deep down, a "shadow" takes place in the earth at the back of the lode. This method is called "shadowing."

To locate a lode at depth: The test as to depth is obtained by restricting the electric field so that audible sounds are only obtained over a given diameter, and with waves of the highest potential possible. Once ascertaining this radius, and contracting is by cutting down the prime energy used and shortening the base line, i.e., narrowing the distance between the transmitting electrodes, the approximate depth to which the waves penetrate is calculated and obviously a lode situated below that depth can show no variation in the field above.

### Lower Freight on Poles

The Board of Railway Commissioners have just handed down a decision in the application made some time ago by shippers of telegraph poles, protesting against paying a higher tariff on that commodity than was charged for transportation of other forest products. The judgment favors the lumbermen to such an extent that about 80 per cent. of cedar poles will in future be carried at a reduction of 25 per cent. in freight rates. It will be a great advantage to the shippers of poles to have this matter finally decided in their favor. They have had many difficulties on account of it in the past. The heavy rates have been great drawbacks to the trade. Competition in the United States has been almost out of the question, while in Ontario, American dealers have been able to obtain trade which ought to go to Canadian firms. On the simple basis of fairness to the trade, they should have as favorable rates as those given to other lumber commodity shippers.

In wiring a private house the foreman or wireman on the job oftentimes makes a good salesman. The casual recommendation of a wireman will do more to induce the customer to install an additional outlet, receptacle, switch, or new device, than all the eloquent pleading of a salesman.

Canadian Manufacturers' Association, annual meeting, Hamilton, Sept. 14th, 15th, 16th, 1909.



## Personal Mention

Mr. H. C. McMordie, B.A.Sc., has accepted a position with Mr. Willis Chipman, Toronto, and will be stationed at Saskatoon, Sask.

Mr. A. N. Jones, of the firm of Jones & Glassco, engineers, Montreal, is at present on a business trip to Europe.

Mr. F. John Bell, who recently resigned as secretary-treasurer and director of the Canadian Crocker-Wheeler Company, has accepted the position of general manager of the Mines Power Company, Limited, Cobalt, Ont.

The Council of the Institution of Electrical Engineers of London, Eng., have appointed Mr. Lawford Grant, of Montreal, honorary secretary and treasurer for Canada in succession to Prof. R. B. Owens, late of McGill University.

Mr. W. Reavell, M.I.M.E., M.I.C.E., of Ipswich, Eng., managing-director of Reavell & Company, manufacturers of air compressors, has been in Canada for the past couple of weeks, and is greatly pleased with the present business outlook in this country. He is accompanied on his trip by Mrs. Reavell.

Mr. Dane Sinclair, general manager of the British Insulated & Helsby Cables Company, Limited, is at present on a visit to Canada, with the object of transferring the company's Canadian rights to the Canadian Insulated & Helsby Cables Company, of Montreal.

Mr. W. H. Reynolds, formerly sales agent for the Canadian General Electric Company, has severed his connection with that firm and joined the Eugene F. Phillips Company, of Montreal. He will be in charge of the eastern business of this firm.

Mr. J. G. Glassco, recently of the Dominion Power & Transmission Company, Hamilton, Ont., has accepted a position as electrical assistant to Messrs. Smith, Kerry & Chace in their design and construction of the 20,000-h.p. generating and transmission plant for the city of Winnipeg. Mr. Glassco will assume his new duties on the 15th of July. He has had a very considerable experience in construction and operation of high tension plants.

Mr. Norman P. F. Death, B.A.Sc., of the firm of Death & Watson, electrical contractors, Toronto, was married on Wednesday, June 16, to Miss Ida May Watson, at Silver Birch Fruit Farm, near Toronto. Mr. and Mrs. Watson afterwards left for a trip to Buffalo and other eastern points.

Mr. J. W. Pilcher, manager of the local offices of the Canadian General Electric Company, reports great activity in all branches of the electrical trade. Judging from the volume of business of the past six months, Mr. Pilcher anticipates a splendid year.

Arrangements are in progress for a seven weeks' trip to Canada by a number of English engineers. The project is styled "the Universities' Engineering Trip to Canada," and arrangements are being made to visit the leading engineering works and places of interest. Mr. N. M. Clougher, 29 Outer Temple, Strand, W.C., is the secretary. The trip will be made about the end of July and there is no doubt but that they will receive a hearty welcome from their brother engineers in Canada.

## A Hydro-Electric Contract

The portion of the electrical equipment, required by the Hydro-Electric Power Commission, awarded to the Canadian Westinghouse Company, Limited, Hamilton, will keep that company very busy for some months to come. Work on the contract will be commenced when the engineering staff have completed the details for the work. The Westinghouse Company will supply a portion of the electrical equipment for the main transforming station at Niagara and the main switching station at Dundas. Their 110,000-volt switches will be used in all the sub-stations. This company also has the contract to equip the transmission lines with a protective relay system. By this system should a ground or other trouble occur on the line at any point that portion immediately becomes dead and the energy is transmitted by means of an auxiliary wire.

The 110-volt equipment will be of a very high standard and will be required to stand a breakdown test of 250,000 volts before it is released from the shops. Five or six firms, chiefly Canadian, tendered for the work, but it was divided between the Canadian General Electric Company and the Canadian Westinghouse Company.

## Central Energy and the Bell

Central energy systems are being used extensively by the Bell Telephone Company throughout Canada in exchanges with 500 or more connections. Contrary to expectation the concentration system is very expensive to operate, but it has been generally adopted as the most modern and up-to-date service arrangement, furnishing, as it does, a more direct connection between customer and the switchboard.

On May 8th, the Woodstock, Ont., exchange, using central energy, was placed in commission, and it is notable that the change-over was effected without an interruption to the service. London, Waterloo, Peterboro and Hamilton are also equipped with this system, and Chatham, St. Catharines, St. Thomas, Berlin and Sault Ste. Marie, Ont., are to have new exchange offices, similarly provided, in the near future.

The power departments in these exchanges, while not large, comparatively, are very reliable. Storage batteries are used and are either supplied from outside or from a generation on the premises. In all cases an auxiliary apparatus is installed and at least one week's energy is kept in reserve, insuring an intermittent service to the customer.

## The St. John Railway Company

The annual meeting of the St. John Railway Company was recently held at St. John, N.B. The annual report showed a net profit of \$52,980. This was divided in two three per cent. dividends, amounting to \$48,000, and the balance to profit and loss account. The following officers were elected: James Ross, Montreal, president; Col. H. H. McLean, M.P., vice-president and managing director; R. B. Emerson, James Manchester, Col. J. J. Tucker, Wm. Downie, H. B. Robinson and E. E. Sayre, of St. John, directors.

Current steals are still persisted in. That the perpetrators do not always escape with impunity is evidenced in a newspaper report from Ottawa, which states that a man was recently fined \$50 and costs for "Theft of Electric Fluid."



# Power Plant Construction

## Provincial Hospital at St. John, N. B.



Outside Cable Construction

The lighting plant of the Provincial Hospital at St. John, N.B., was badly damaged by fire on Jan. 5, 1909. The power house equipment was situated in the centre wing of an E-shaped building, and was installed in June, 1908. The equipment at that time consisted of two Ideal engines, 10-inch x 10-inch, direct connected to two 30-k.w., 125-volt, 4-pole compound wound Eddy generators at 325 r.p.m.; a marble switchboard and two 50-h.p. return tubular boilers. Five pairs of No. 2 B. & S. and one pair of No. 2 B. & S. feeders carried the load of the plant, consisting of 800 16-c.p. lamps, 18 electric irons, three 5-h.p. motors, one 7-h.p. motor and one 26 h.p. Crocker-Wheeler motor. During the shut-down of about seven weeks the load was carried by the St. John Railway Company, and in the meantime the Vaughan Electric Company, Limited, of St. John, N.B., were busy repairing the damage. The fire started in the laundry and destroyed most of the feeders, together with one 5 h.p. motor driving a centrifugal pump, the large 26 h.p. motor driving the laundry, the electric irons, switchboard and generator cables. The dynamos, engines, and steam piping suffered more or less, but the boilers, filled with water, were uninjured. About 1,800 feet of No. 2-0 cable was required to replace the burnt out feeders. The new switchboard installed consisted of a single piece of Monson slate 5 feet x 6 feet x 1 foot  $\frac{5}{8}$  inches thick, and presents a very fine appearance.

## Kamloops Municipal Plant

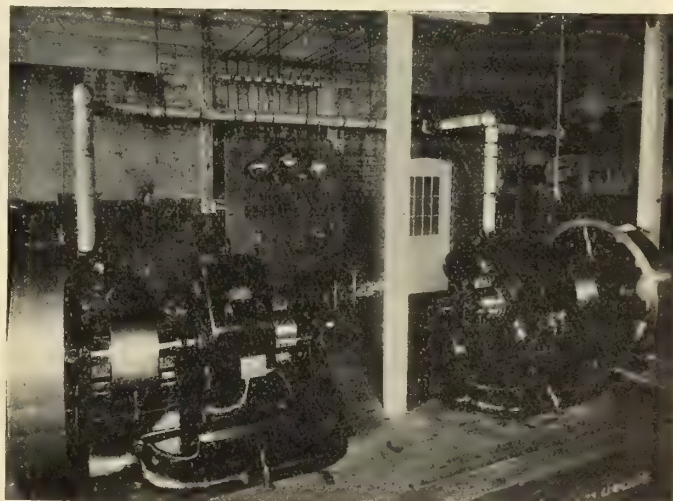
In 1896 the Kamloops Electric Light Company commenced operations as a municipal plant. The equipment installed at that time consisted of a single phase alternating current system. Two 125-cycle machines, one of General Electric and the other United Electric make, with a total capacity of 180 k.w., were installed, and connected to a Robb engine, the boilers also being supplied by the Robb Company.

To-day the load has outgrown the present plant and under the supervision of Mr. H. K. Dutcher will shortly be extended and a new system installed. It is the intention to build a new power house and extend the capacity of the plant to 500 k.w. within the next two years. These alterations, together with a proposed pumping plant, will necessitate an expenditure of \$70,000.

With this project in view the present equipment is to be altered to a three-phase, 60-cycle, 2,200-volt system. One new direct connected 150 k.w. steam engine set, one new 150 h.p. return tubular boiler, a temporary belt driven 150 k.w. generator for engine now in service, and a new and complete switchboard, will be installed at once in the old power house at a cost in the neighborhood of \$22,000. When the new power house is finally built and equipped Kamloops will have a very modern plant that will be second to none in the West.

## Plant Extension at Nelson, B. C.

A further instance of the rapid growth of the West is found in Nelson, B.C. Twelve years ago the new municipal plant was opened with a main unit of 750 k.w. capacity, which was more than ample to supply the lighting and power demands at that time. The load curves at the plant have warranted an increase in the capacity and it has been decided to make further use of the Bonnington Falls, where a 60-foot head is available. The present generator will be augmented by another of the same type, which is at present being built in the Allis-Chalmers-Bullock Company's shops at Rockfield. The generator will operate at 180 r.p.m. and will be of the latest improved 1,000 k.w., 12,000 volt, 60 cycle, three-phase type. The turbine will also be built by this firm and will be the usual vertical single runner type, with the runner of cast bronze, and is direct connected to the vertical shaft. The exciter unit will consist of a 50 k.w., 125-volt machine operating at 575 r.p.m., belt driven from a horizontal shaft, connected by bevel gearing to the main vertical shaft. The horizontal governor drive is similarly obtained by a bevel gear arrangement. The thrust bearing is situated below the generators and above the water wheels and is designed to carry 55,000 pounds pressure at 180 r.p.m. without the assistance of oil pressure. A somewhat new feature is obtained by the use of a friction brake of the band type, situated below the thrust deck and operated by hand from the generator floor. The operator is enabled



Power Plant—Provincial Hospital at St. John, N. B.

by the use of this brake to close down the unit in unison with the closing of the water gate.

The lubrication of the vertical bearing is obtained by the use of a gravity system; the oil enters at the top of the upper bearing and after passing through, it is piped to the lower bearing, where it is collected and used again. It is expected that the additional units will be installed and ready for operation by the first of November.

The city of Winnipeg will make an elaborate electrical display during their Industrial Exhibition, from July 10-17. No effort or expense will be spared to make it the greatest single summer display yet held in Canada. The immense possibilities that will arise from the city's power development scheme are to be featured.



# Electric Railway Department

## A Street Railway Storage Battery

About three months ago the British Columbia Electric Railway Company, Limited, installed in their Victoria plant a storage battery and booster set by means of which they have been able to maintain a practically constant voltage on their trolley lines. Through the courtesy of Mr. C. A. Cornwall, of Victoria, we are able to furnish our readers with an illustrated description of this interesting installation.

The plant of the British Columbia Electric Railway Company, Limited, consists of a sub-station in Victoria and a main generating station at Goldstream, the latter being about twelve miles from the city. In the generating station are installed four units having a total output of 2,000 k.w. These generators are direct connected to Pelton water wheels, operating under a 645-foot head, and power is transmitted at 20,000 volts over a three-

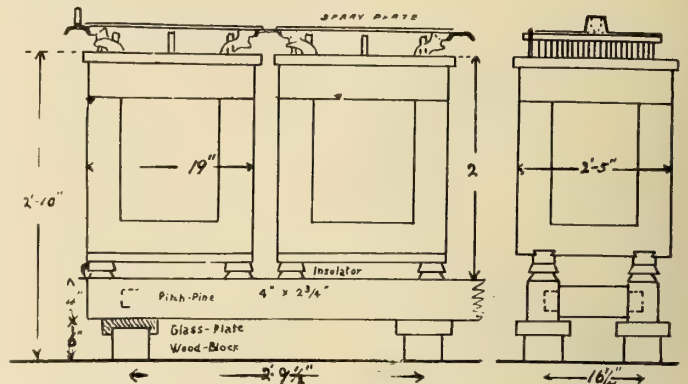


Fig. 2.—Showing the Insulation of the Storage Battery Tanks—British Columbia Electric Railway Company's Plant at Victoria, B. C.

### Charging Rates.

Maximum .....	585 amperes
Two hours .....	460 amperes
Continuous .....	312 amperes

### Discharging Rates.

1,800 amperes for 5 seconds.
1,500 amperes for 2 minutes.
962 amperes for 1 hour.
704 amperes for 1½ hours.
576 amperes for 2 hours.
498 amperes for 2½ hours.

A good idea of the battery and the interior of the battery room may be obtained from fig. (1). The building is of brick, and the wall on the right hand side separates it from the booster and the switchboard. The tanks are insulated from the floor by the wooden stand and insulators shown in fig. (2). Fig. (1) also shows the insulated platforms between the rows of cells. The battery and rotary terminals are connected to the booster and



Fig. 1.—The Battery Room—British Columbia Electric Railway Company's Plant at Victoria, B. C.

phase line to the sub-station. Here two 300-k.w. General Electric, rotary converters running at 900 r.p.m. supply power for the railway, the load averaging 470 k.w. and often running up to 900 k.w., or 50 per cent. overload. The rotaries were at times helped out by the reserve steam-plant consisting of a 500-k.w. Westinghouse railway generator direct connected to a Laurie compound engine, together with a 200-k.w. and an 80-k.w. Edison bi-polar 500-volt machine, the two latter machines being rope driven by a 300-h.p. engine.

The battery was supplied by the Tudor Storage Battery Export Syndicate, of London, and consists of 260 cells, having a 1,200 ampere-hour capacity, allowance being made for a 25 per cent. increase. The tanks are of the lead-lined type and at present contain fourteen negative and thirteen positive plates, these plates being 14 x 14½ inches. The electrolyte of 1.180 specific gravity was manufactured by the Victoria Chemical Works of this city. The plates are supported by glass and are separated by treated wooden boards, these boards being strengthened by three wooden rods.

Below are given the charging and discharging currents:—

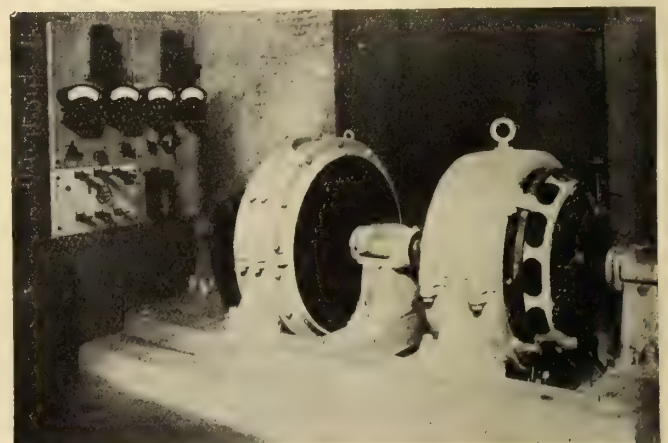


Fig. 3.—Booster Set and Switchboard—British Columbia Electric Railway Company's Plant at Victoria, B. C.

switchboard by means of three 500,000-c.m. lead-covered cables.

Fig. (3) gives a view of the booster set and its switchboard. These were supplied by the Lancashire Dynamo & Motor Company, of Manchester, England. This booster



is direct-connected to a 120-h.p. interpole 550-volt d.c. motor built by the Lancashire Company, and is a six-pole machine having the following guaranteed outputs:

Amperes.	Volts.	Time.
1,100	30	1 hour.
1,100	95	10 minutes.
800	0-100	Continuously.
800	0-120	2 hours.

The switchboard consists of two marble panels with the following instruments.

1,000-0-1,500 indicating ammeter indicating charge & discharge  
 100-0-180 " voltmeter indicating boost.  
 0-300 " ammeter indicating motor current.  
 400-750 indicating voltmeter indicating battery or line volts.  
 1,250-1,500 recording ammeter indicating charge and discharge.

No voltage release, time limit circuit breakers are put in on battery and booster circuits. A diverter for regulating the load on rotaries is installed.

The load of this company is the usual street railway load. The first noticeably heavy load comes on at seven o'clock in the morning and reaches a peak point again shortly after twelve o'clock noon. It is heavy again at four o'clock and five-thirty in the afternoon. The night load is heavy at eight o'clock and again at eleven p.m.

The installing of this battery and booster was done under the supervision of Mr. G. M. Tripp, the company's general superintendent in Victoria.

### A Standard Height for Car Steps

The decision of the Ontario Railway and Municipal Board, standardizing the height of car steps will be interesting to all operating companies in Canada.

In September, 1908, Dr. Helen MacMurchy, of Toronto, filed an application with the Board asking for a regulation fixing the height of the first step on street and electric railway cars at from nine to twelve inches from the ground, and of the other steps with a rise of from seven to nine inches, one above the other.

This action developed into a controversy between the city of Toronto and the Toronto Railway Company, and was confined to the company's cars and operating conditions in Toronto.

Expert medical evidence placed the proper height for the first step at as near twelve inches as possible. The Board, however, did not overlook the difficulties connected with the building and operation of a car equipped with a 12-inch step. The difficulty lay only with the double-truck cars, and at the suggestion of the Board, the railway company equipped a three-stepped car of this type as an experiment. While convenient and comfortable it extended so far into the street as to be dangerous to pedestrians and vehicles, therefore it was not viewed favorably by the Board.

Mr. J. T. H. Wyse, engineer for the Board, investigated the possibilities of equipping a car with lateral seats, with an aisle down the centre. The impossibility of operating a car with a wider inside breadth than 80 inches, on account of the narrow devil-strip on the company's lines prevented a solution of the difficulty by this method.

To assist the Board in coming to a conclusion, the Railway Company built another car, which was described in the June "Electrical News." In this car the body came within 38 inches of the ground. This left too small a margin of safety for the operation of brake rods or compressed air pipes, so this car, in turn, was rejected by the Board, it being their opinion that the floor of all

cars should not be less than 40 inches above the rail level.

The following step heights were finally adopted as standard by the Board: Open double truck cars, from 14 to 16 inches for the first step and 14 to 12 inches for the two upper steps. On open single truck cars, 12 to 15 inches for the first step and 12 to 9 inches for the two upper steps was the height adopted. With closed double truck cars the first step must be from 14 to 16 inches from the ground, and on closed single truck cars from 12 to 15 inches. The conditions of operation in Toronto are considered more difficult than in any other Ontario town, therefore this regulation will apply to all street and electric railways in this province.

### Progress of a Western Ontario Electric Road

The Sandwich-Windsor & Amherstburg Railway is a development of the Sandwich & Windsor passenger railway which was built between Windsor and Sandwich in 1873 and operated as a horse car line until 1890, when the road was rebuilt and electrified.

After operation under this system for two years the road became involved in financial difficulties and was sold to a few local men, including the present manager, Mr. James Anderson. Other interested parties were Messrs. Jno. Davis, W. J. McKee, W. J. Pulling, of Windsor, and Mr. Robt. Thompson, of Hamilton. Since then the road has been gradually improved. In 1901 the road passed into the hands of the Detroit United Railway, who retained Mr. Anderson as their general manager, with a free hand to extend and improve the property.

The road has been extended to Amherstburg, twelve miles below Ojibwa, and in 1906 the company took over the assets of the Windsor & Tecumseh Electric Railway and completed nine miles of this company's line to Tecumseh.

Through cars are run between Tecumseh and Amherstburg, a distance of 27 miles, on frequent schedule. Altogether the Sandwich, Windsor & Amherstburg Railway operate 35 miles of track, and in 1908 they handled 3,000,000 passengers on their interurban lines.

### New Cars Electrically Equipped

The Canadian Pacific Railway Company have under construction at their Angus shops 22 new observation-type cars. These are approximately 84 feet long and have been equipped with a motor geared to the axle to supply lighting to the cars. These cars have been wired and fitted under the direction of Mr. Shaw, the company's electrical engineer, and embody several original features, notably a berth lamp designed by Mr. Shaw.

### 2800 Daily Indications

The schedule on the Mimico branch of the Toronto & York Radial Railway consists of a regular 20-minute service, with 15-minute cars at certain hours. About 2,800 daily signal indications are made by the Simmen Automatic Railway Signal System. In our description of this system in our June issue 800 was the number stated.

It is stated that the highest generator voltage in use is that at a hydro-electric plant at Manojlova Falls, on the Kerka River, in the Province of Dalmatia, Austria-Hungary, which generates electric current at 30,000 volts. This is fed direct to the line without the use of step-up transformers and transmitted 21 miles.



# TELEPHONE TOPICS

## Method in Service Wire Attachment

Marvelous, to anyone who understands the subject, are the different kinds of service wires and methods of attaching them used by telephone companies in various parts of the country, says A. F. Warner in "Telephony." The ingenuity, the originality, and the artistic ability made evident in the fixtures used and their mounting make a very interesting study. In some cases the student will wonder why subscribers do not object to the novel attachments to their buildings. It is probably because they have been persuaded that the attachments are lesser evils to be put up with cheerfully in order to obtain the great benefits of telephone service. There stands a record of one subscriber who had the temerity to "kick" because a couple of linemen wanted to put on the front of his house a beautiful iron bracket made of strap iron two feet long, with two prongs, each a foot long, stuck out at a right angle to carry pony glass insulators set in plaster paris. It is needless to say that it was made in a blacksmith shop, as no reputable dealer would be guilty of such an indiscretion as to put this kind of a device on the market. The peculiarities seem to run with the people the farther one goes from the large cities where this work is done according to specifications.

Judging from all appearances, the real object of running service wires in some companies' plants seems to be to get a connection from the pole lead to a subscriber's instrument with the least effort, least material and the quickest time, without regard to neatness, durability, first cost or expense of fixture repairs. In some counties there are about as many methods of reaching a subscriber's house and instrument as there are different telephone companies. Often one company will have several, all of which have some fault, either in cost, lack of neatness, or durability.

Although a telephone line is not expected to carry high tension current, there is always a liability of its coming in contact with a dangerous foreign wire in open construction, in spite of all the care a telephone company may take to keep clear. The telephone manager can neither dictate nor keep track of a new electric light construction all the time. There is also the chance that old light wires will become defective. Service wires must be run with an eye to future happenings on the electric light system, to keep clear of trouble.

Among some linemen there seems to be a reckless disposition to make joints. The writer has observed no less than eight splices in a pair of wires running fifty feet from a pole to an arrester. The rest of the construction was the finest to be had. Besides the joint hazard, a prolific source of trouble, there is the crossing hazard. Bare wires left slack will cross. If pulled tight on the house so they will sing, the manager will lose his subscriber, or get lost himself in a cloud of abuse. What looks worse than to see a nice-looking residence with two bare, slack wires, coiled like a long-drawn-out bed spring, fastened to a pole four feet apart, to keep them from crossing, and running to the front or side of the house, where they are attached to two big red wooden brackets or blacksmith-made iron ones? This is sight enough to eliminate bare wires from the mind of a manager who cares for the satisfaction of his patrons.

Next in order on the upward scale come covered wires. Rubber covered wires, twisted in pairs, if one

wants to stand the expense, look well, and it does not take much labor to install them. If they are run through trees it is surprising how quickly they will deteriorate by chafing. Even if run clear when put up, a too neighborly tree may grow up, and the wire sag down, until they meet. It has also been observed that, when attached under the eaves of a house on malleable iron brackets, and pulled tight from top to bottom, such a wire will grow slack after a time and the wind will whirl it around like a jump rope. The wire will not stand this condition long before the metal crystallizes, breaks, and there is a case of trouble and another splice. Attachment at frequent intervals, therefore, is necessary.

Single, weatherproof covered wires, either of copper or iron, with two braids and a winding, have given the writer very good satisfaction. The covering acts as a three-fold protection. Mechanically speaking, it preserves the wire against chafing and the weather electrical protection against high tension currents is afforded to a certain extent. It has been known to resist 2,300 volts and more until the insulation was broken down by the action of wind and rain. Protection against loop crosses is, of course, a valuable feature secured by the use of this wire. In wet weather there are numerous places where the use of bare wires would mean immediate trouble, especially on a common battery system. In any of these cases where contacts with trees, etc., are made, if the weatherproof wire is used, a company is saved a condition of actual trouble for some time, and gives the inspector a chance to see these faults and have them repaired before actual damage is done.

A covered wire, even if iron, will, of course, not deteriorate as fast as one that is bare. The metal is the last to go, and the covering will protect it for a long time. If iron wire is used it should be the very best galvanized wire obtainable. The labor cost of installing single covered wires is a little more than for installing twisted pair rubber covered, but the cost of material and labor is in favor of the single covered wires.

The varieties of house and pole attachments are numerous, and many of them are conspicuous and clumsy. Nearly all iron attachments will rust, in spite of paint and enamel, and leave a streak of rust on a white house. Porcelain knobs, size No. 4, have not been rivaled for cheapness and ease of installing. They are not big and clumsy. They should be put on with flat head screws, not shorter than  $3\frac{1}{2}$  inches, and if the wood is hard, they may be driven part of the way in. If the pole happens to be out of line they will hold against a considerable strain. A pair of red-painted brackets on a white or other colored house is something that should never be seen. If brackets must be used, spend a little money to paint them the right color.

As no two houses are liable to be alike and in the same position from the pole, no set rule can be followed in making attachments. Some are brick, some of wood, and now we find an increasing number built of concrete. The method employed by the writer on a wooden house is to place two solid knobs about a foot apart, well up under the eaves, and in the rear of the building, if possible. Then two-piece knobs of a smaller size are used for running down the side, being preferably placed near the corner board, four feet apart. The knobs should have heavy caps and be toothed as well as slotted. Some double knobs, as used for electric light work, are provided with four slots, two large and two small.



The slots to use are those which will bind the wire tightest. The first split knob should be placed a little below and beyond the lowest solid knob. The dead end of the wires on the solid knob should be long enough to reach inside of the building, curved over and fastened solid in the split knob. It is usual to take the bight of the wire and twist it around itself before attaching. Then place the loop in the groove of the knob and twist it close. That saves drawing the long end around the wire a number of times. Cutting is to be avoided. This part of the work should be done first and the wire pulled down from the pole end.

When the wires have been attached at the top, they are separated, pulled tight, and fastened with the cap of the bottom knob on the sill. The pulling is done with two pairs of connectors, with their ends caught under the edge of the sill, to give a good leverage. Before slacking off the strain, the other knobs are set up tight. This equalizes the strain and leaves the wires straight, rigid and parallel, separated by a distance of about  $1\frac{1}{2}$  inches. Using a little care and judgment will insure a neat job. Often the wires follow along a leader pipe,

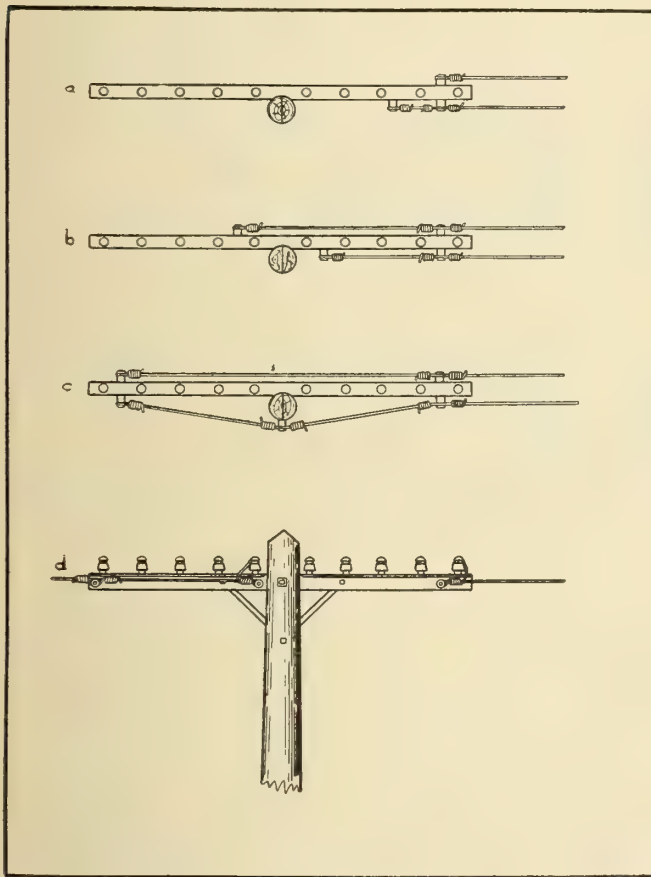


Fig. 1.—Method of Taking House Drops from Pole, Using Porcelain Knobs.

which will conceal them from a person looking from the front of the house.

After the lower attachment is made, the wires are turned at a right angle and continued on knobs in a horizontal line to the centre of the nearest cellar window. Here two 11-16-inch holes are bored in the frame and bushed with porcelain tubes. Putting the wire through these with a drip loop on the outside completes a job which will meet with the approval of the National Board of Fire Underwriters. The inside wireman to put the arrester directly on the line, in a light, convenient place. Some difficulty may be experienced in boring the long

holes in the window casing, but an Irwin bit will do the trick with the least labor.

In placing service wires on houses, the place of original attachment and entrance depend somewhat on the location of the telephone. The outside wires should be run so as to use the least wire and labor inside. If the telephone is to be placed on the first floor, the best plan is to run to the cellar window. This puts the arrester in the best place to reach grounds for ringing and protection. One disadvantage in this location is that malicious persons or thieves can easily reach the wires and put the telephone out of service. In many cases the wires can be run into the attic, especially if the telephone is on the second floor.

Knobs are used by the writer when service loops are taken directly off the pole, and these are put on the arm by the following method:

First: One on each side of the end of the arm where the service wires leave. Second, one on each side of the arm on the remote side of the pins on which are run the wires to be tapped, A, fig. 1. Pole pin wires are knobbed on the arm as shown in diagram b. Pairs on the end of the arm which is away from the house are knobbed as shown in diagram c.

The end sought is insulation as near perfect as can be obtained. The service wires are below the surface of the arm, where they cannot be disturbed, injured by running in new wires, or walked on. If for any cause a glass gets broken, or the wire of another line is poorly tied so that it lies on the arm, it does not cause a cross with another circuit. The knobs and wires, furthermore, do not interfere with passing up and down on the pole. In cases where two different circuits lead from the same end of the arm, a double row of knobs is used.

The object of placing the knobs on the remote side of the pin is shown by diagram d. The wires are dead-ended under the line wires, and tied in at all of the other knobs. The position of the knob brings the turns of the dead end directly under the lead wire, where the end is turned at right angles, stripped and disconnected. The sleeve tap is the best, but a joint well covered with tin-foil and tape is sometimes used, although it is not to be recommended. Soldering will either be shirked by the linemen entirely, or be poorly done. In all cases it is well to have service wires so regularly run that any person can readily see, from the ground, what lead wires are taken by them.

### Alberta's Rapid Development

The Alberta Telephone System now comprises 1,400 miles of trunk lines and about 600 miles of farmers' rural lines. The longest distance in which communication can be had is between Lloydminster and Cardston, a distance of nearly 700 miles. Since the 1st of May about 200 miles of trunk lines and about 400 miles of farmers' private lines have been constructed. In addition to this an extra circuit is in progress of construction between Edmonton and Calgary, and also one between Lethbridge and Macleod. On the Edmonton to Calgary circuit, communication can now be had as far as Wetaskiwin, while the extra line between the southern points is nearly completed. Other lines recently completed and now in daily service are from Edmonton to Pembina and from Edmonton to Brosseau and Shandro in the north and east districts of Victoria. In the south a new trunk line has been completed from Lethbridge to Taber and in Central Alberta from Daysland to Sedgewick. It is only six months ago that there were 35 telephone exchanges and toll offices in the province, whereas now there are 165.



# Current News and Notes

## **Alameda, Sask.**

Tenders addressed to J. T. Gordon, secretary-treasurer, were received until June 25th for building about 70 miles of telephone lines.

## **Bridgetown, N.S.**

The town will install a new system of lighting. A special committee of the council is investigating.

## **Bridgewater, N.S.**

Plans are being considered by the Canadian Mines Company for the construction of a hydro-electric power plant to supply electricity to operate the mines and to supply the city of Bridgewater with electricity for lamps and motors. The company also proposes to furnish the surrounding territory with electrical service.

## **Berlin, Ont.**

The ratepayers have approved a bylaw to raise \$19,000 for double tracking a section of the street railway track between Berlin and Waterloo.

## **Brockville, Ont.**

Mr. Conroy, of Aylmer, Que., representing a power development company, recently waited on the Board of Light Commissioners with a proposition to transmit electric energy to Brockville. He stated that his company were prepared to develop on the Gatineau river 50,000 horse power, 20,000 of which would be delivered on the transmission line which it was proposed to build to Brockville. The matter is in abeyance.

## **Calgary, Alta.**

The Calgary Power & Transmission Company is preparing plans for a power development this year at a cost of \$700,000. Smith, Kerry & Chace, civil engineers, of Winnipeg, Man., and Toronto, Ont., are in charge of the work.

## **Emerson, Man.**

It is reported that the Great Falls Power Company is contemplating the construction of a transmission line from Emerson to Grand Forks, N.D., for the purpose of supplying electricity in that city.

## **Edmonton, Alta.**

A French syndicate, represented here by Short, Cross & Biggar, attorneys, has applied to the city council for franchises for the construction of radial railway lines from this city with a total mileage of 160. The franchises will, in all probability, be granted, the Council being strongly in favor of the proposition.

The Provincial Government has entered into an agreement with the Automatic Telephone Company, of Chicago, Ill., to install automatic telephone systems in East Calgary and Lethbridge. It is understood that similar equipment will be placed in other cities in the province during the summer.

## **Hamilton, Ont.**

The ratepayers of this city recently carried a by-law authorizing the council to make a contract with the Ontario Hydro-Electric Commission. The proposed agreement between the city and the Cataract Power Company was defeated.

## **Hensall, Ont.**

Tenders are asked for the construction of a telephone system in Tuckersmith

Township consisting of 100 miles of line and 230 telephones. For further information address A. G. Smilie, clerk.

## **Hanley, Sask.**

The council is negotiating with the Saskatchewan Government for a local telephone system to be built this year, either by the province or by the town with provincial assistance. For further information address G. F. Daintree.

## **Kelowna, B.C.**

The municipal power plant which was recently destroyed by fire will soon be rebuilt.

## **Moose Jaw, Sask.**

Tenders are invited by the city for electrical appliances, supplies, etc., up to July 19th.

## **Moncton, N.B.**

At a recent meeting of the Water and Light Committee tenders were opened for generator, engine and boiler for electric light works and referred to City Engineer Edington for report at a later meeting. The tenders were as follows: Babcock, Wilcox Company, Limited, for water tube boiler, \$2330. Robb Engineering Company, for return tubular boiler, 125 h.p., \$1040; Robb Mumford boiler, 150 h.p., \$2100. Robb Engineering Company, for Robb Armstrong Corliss engine, \$5448; for compound engine, 450 h.p., \$6522. Canada Foundry Company, for return tubular boiler, \$1495; for Standard boiler, \$1185; for water tube boiler, \$2,015. John McDougall Caledonia Iron Works Company, Limited, for 165 h.p. return tubular boiler, \$1,190; for water tube boiler, \$1,817; from same firm for generator, \$6,000. E. Leonard & Sons, London, Ont., simple Corliss engine, \$3,375; compound Corliss engine, f.o.b. cars, Moncton, \$5,950; from same firm for return tubular boiler, \$1,063. Canadian General Electric Company, for generator, \$6,745; for engine and generator, \$13,110; for engine and boiler and generator, \$16,120; the same firm offered to install plant with Robb engine for \$13,272; with Cross compound engine, \$14,325. Canadian Westinghouse, for generator, \$7,395. I. Matheson & Company, New Glasgow, for return tubular boiler, \$1,100, with dome; \$1,050 without dome. Laurie & Lamb, compound engine and generator, \$10,500. Golding & McCullough, Galt, Ont., for Corliss simple engine, \$5,289; Corliss compound engine, \$8,352; for boilers, return tubular, \$1,055; water tube boiler, \$3,218.

## **Montreal, Que.**

We are advised that the Montreal Engineering Company are at present in the market for four hydro-electric units with an aggregate capacity of 50,000 h.p., for the Western Canada Power Company, Limited. It is probable that two units will be installed immediately.

Contracts have been placed by the trustees of the McGill University for the installation of a power plant for the university, at an approximate cost of \$150,000. Prof. R. J. Dureley, of McGill University, will have charge of construction of the plant.

The Saraguay Electric & Water Company has submitted a proposition to the city council offering to supply electricity in

four city wards, and also agreeing to make a start on the municipal electric light plant at advantageous terms. The company is willing to furnish electricity for lighting the whole city if sufficient time is given them to make preparations. The company offers to furnish the city with electrical service until the city is ready to install a municipal electric plant without further cost other than the annual cost of the lamps, the city to purchase the lamps when installed in the streets at their actual value, and also offers the use of its poles in case it decides to take over the street lighting system, the price for same to be fixed by the Public Utility Commission. The company will be prepared to furnish electricity to Duvernay, St. Jean Baptiste, St. Louis and Lafontaine wards within three or four months.

## **Melville, Sask.**

The council has appointed a deputation of ratepayers to wait on the Provincial department of telephones for the purpose of securing a local telephone system and long distance connection. For further information address Leon Benoilt, of Melville, Sask.

## **Niagara Falls, Ont.**

The Niagara Power Company have authorized the issue of bonds to provide twenty-five million dollars. Several millions of this will be spent in extensions to the Canadian plants.

The managers of the municipal electric light plant are making a test of a 25-cycle arc lamp and should it prove satisfactory it is said that the entire system will be changed.

## **North Portal, Sask.**

Tenders have just been taken for building 31 miles of telephone lines at this place. Address John Hill, Secretary-Treasurer, North Portal Rural Telephone, Limited.

## **Ottawa, Ont.**

The Bell Telephone Company has made application to the city for authority to open up for its lines portions of the following streets: Metcalfe street from Queen to Slater, and Slater, from Metcalfe to Bay.

It is reported that options are being taken on water powers about the city of Ottawa to be utilized to generate electricity for the proposed Morrisburg & Ottawa Railway. Under the present plans it is proposed to transmit electricity to Ottawa where it will be used to operate the railway from Ottawa to Morrisburg; also for lamps and motors to villages along the route.

## **Regina, Sask.**

The ratepayers have voted in favor of the proposition to issue \$78,000 in bonds, the proceeds to be used for the construction of a municipal electric light plant.

## **Strathcona, Alta.**

The ratepayers will vote on July 7th on a bylaw to provide for borrowing \$15,495 on extensions to the electric light and power plant.

## **Toronto, Ont.**

Bids will soon be received by the City of Toronto for the following apparatus:—Two 1,500 h.p. induction motors direct connected to turbine pumps; four 1,500 h.p.



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Tenders closed June 30th with the Electrical Department for laying between 350,000 and 450,000 duct feet of underground conduit.

The Hydro-Electric Power Commission of Ontario will receive tenders for the construction of transformer station buildings in Niagara Falls and Dundas.

### Victoria, B.C.

The British Columbia Telephone Company has decided to place all its wires in Victoria under ground. In return for certain privileges the city will bear one-tenth of the cost of the work. The city also finances the scheme and the company pays interest and sinking fund charges.

Owing to the delay of the City Council in acting on the recent proposition by the British Columbia Electric Railway Company, the plans for the development of water power on Jordan river have been held up. The company is willing to continue to take power from Goldstream if the city buys out the Esquimaux Company's works. It is endeavoring to secure the endorsement of the Board of Trade in connection with its proposed plans.

### Vancouver, B.C.

The proposed extensions to the British Columbia Electric Railway were approved at a recent meeting of the Works Board.

### Winnipeg, Man.

Tenders for grading spur line of the tramway of the city leading into their power house were received until July 3rd by M. Peterson, Secretary, Board of Control.

Tenders on the hydraulic machinery required in the Winnipeg power development scheme will be called on the 2nd of August and on the electrical equipment on the 16th of August. Distribution of plans and specifications will be made from the office of Smith, Kerry & Chace, Winnipeg.

The initial installation at the Thirty Foot Falls generating station of the Winnipeg power development scheme will consist of five direct connected 3,000 K.V.A. 60 cycle, 3 phase, generating units and two banks of transformers, each consisting of three single phase transformers of 3,000 K.V.A. capacity. All electrical control and other auxiliaries, excepting turbine governors will be tendered. The contractors at the site of the works have made good progress, have large plant installed, have unwatered the power house site, and will shortly begin placing concrete in the dams, and walls of plant. The execution of the transmission line contract is well under way and shipments of towers and cable, as also insulators, will begin during July and August, respectively.

### West Toronto, Ont.

The Toronto Suburban Railway Company was recently given a new lease by the railway committee. It is stated that the company proposes to continue its line at present built to Weston, up to Brampton and along through Peel, Wentworth, and Welland Counties to Port Colborne. It also proposes to continue its line at pres-

ent built as far as Lambton Mills along to Hamilton and on through Wentworth and Lincoln counties to Niagara Falls. It was decided to give the company two years in which to start and five to finish the work.

### AWARDED.

#### Cobalt, Ont.

The contract for the building of the electric road between Cobalt and Haileybury was awarded to the Nova Scotia Construction Company, of Sydney, C.B., at \$125,000.

#### Campbellford, Ont.

The Seymour Power and Electric Company are installing a pair of direct connected motor-driven centrifugal pumps, pumps, built by the Smart Turner Machine Company, Limited, of Hamilton, Ont.

#### D'Israeli, Que.

The St. Francis Hydraulic Company, of D'Israeli, Que., have placed an order with the Canadian General Electric Company for three 300 horse power Canada water tube boilers, together with one 1000 k.w. 2,300 volt, 3-phase 60-cycle turbine driven generator.

#### Vancouver, B.C.

The London Board of Directors of the British Columbia Electric Railway Company has voted to appropriate \$2,500,000 for extensions and improvements to its system in Vancouver during the next twelve months. R. H. Sperling, general manager of the company, states that over half of the amount appropriated will be used for the construction of new tram lines in Vancouver. A new 10,000 h.p. water wheel and generator will be installed at the generating plant on the North Arm of the inlet at a cost of \$250,000. A new dam will be erected at the mouth of Lake Coquitlam, to cost \$200,000. Improvements will be made to the New Westminster interurban line between Vancouver and Central Park, which will involve an expenditure of about \$200,000. The company will also equip the railway recently built by the Canadian Pacific Railway Company from New Westminster to Eburne along the North Arm of the Fraser to be operated by electricity. Several other extensions are also contemplated by the company.

#### Wellandport, Ont.

H. Lloyd, of Dunnville, has been awarded the contract for the construction of the first ten miles of the Dunnville, Wellandport & Beamsville Electric Railway. The railway will be about 23 miles in length, and will connect Dunnville, Wellandport and Beamsville. Jas. A. Ross, Wellandport, President.

#### Winnipeg, Man.

The contract for supplying and installing the electric lighting fixtures in the Fort Garry depot has been awarded to the Robert Mitchell Company, Limited, of Montreal and Winnipeg. It covers all chandeliers and lights, exclusive of the wiring, which is covered by a separate contract, and involves a sum in the neighborhood of \$30,000.

### ELECTRICAL COAL MINING.

A new code, to regulate bituminous coal mining in Pennsylvania, which has been prepared by a commission appointed by Governor Stuart, will, if adopted, prohibit the use of electric power, according to the statement of coal operators. At a meeting held to protest against the code it was asserted that its provisions would require the removal of millions of dollars' worth of electrical machinery now in use.



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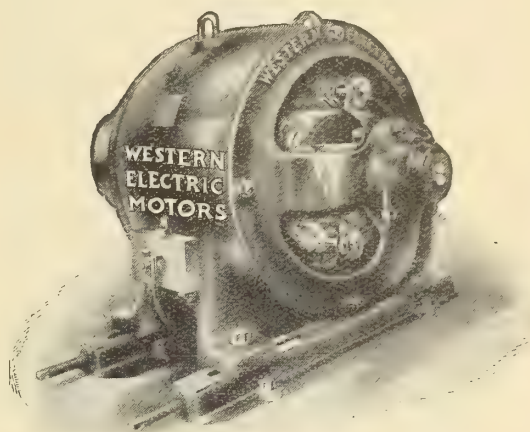
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trical machines. In operation they are as simple as a shaft rotating in its bearings and require no attention beyond that given to bearings.

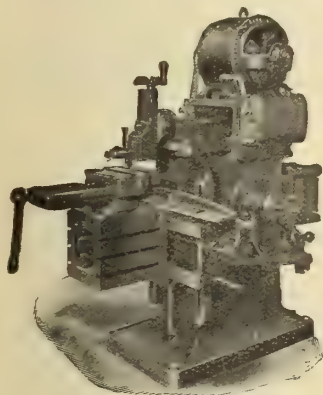
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## The Failure of a Power Dam, due to Weak Joint between Steel Face Plates and Sheet Piling

A dam on the Missouri River, known as the Hauser Lake dam, and built for the purpose of supplying water for generating electric power, gave way a short time ago. The dam, which was constructed of steel, was 630 feet in length and 70 feet in height. It was built up of steel bents, upon which were carried curved steel plates, forming the water-face of the dam. The dam was supported at each end on solid rock, but for about 400 feet in the centre had a gravel foundation. At the upstream toe it was anchored to Freistedt sheet piling driven into the hard river bed. Under the plates and down stream from the sheet piling was a rubble masonry fill. The failure commenced at a point about 400 feet from the east end of the dam, at which end the power house is situated. The way in which the failure took place was apparently owing to the joint between the steel face plates and the sheet piling giving way and thus allowing water to pass through under the masonry fill. The gravel upon which this rested was rapidly washed away, causing the masonry, together with the lower end of the girder forming the upper member of the steel bent, to settle down. The result of this was that the joints between this girder and the plates at the top of the masonry also failed, leaving the bents and plates unsupported, so that the water was able to push them over. About six minutes after the water came through under the masonry the first part of the dam fell—a section of about 30 feet in length. After this gap had been made the foundations were rapidly undermined, and bents continued to fail until the width of the breach reached nearly 300 feet. The cost of the total damage is estimated at \$37,500, not including that to the dam, and the only reason that

this moderate figure was not exceeded is due to the favorable nature of the river below the dam.

### MOONLIGHT SCHEDULE FOR JULY.

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
July 1	1 20	July 1	3 50	2 30
2	No Light	2	No Light	
3	" "	3	" "	
4	8 00	4	10 30	2 30
5	8 00	5	11 10	3 10
6	8 00	6	11 50	3 50
7	8 00	8	0 20	4 20
8	8 00	9	0 50	4 50
9	8 00	10	1 20	5 20
10	8 00	11	1 50	5 50
11	8 00	12	2 20	6 20
12	8 00	13	2 50	6 50
13	8 00	14	3 30	7 30
14	8 00	15	4 00	8 00
15	8 00	16	4 00	8 00
16	8 00	17	4 00	8 00
17	7 50	18	4 00	8 10
18	7 50	19	4 00	8 10
19	7 50	20	4 00	8 10
20	7 50	21	4 00	8 10
21	7 50	22	4 00	8 10
22	7 50	23	4 00	8 10
23	7 50	24	4 00	8 10
24	7 50	25	4 00	8 10
25	10 10	26	4 00	5 50
26	10 40	27	4 00	5 20
27	11 10	28	4 00	4 50
28	11 50	29	4 10	4 20
30	0 40	30	4 10	3 30
31	1 40	31	4 10	2 30

Total .....168 40

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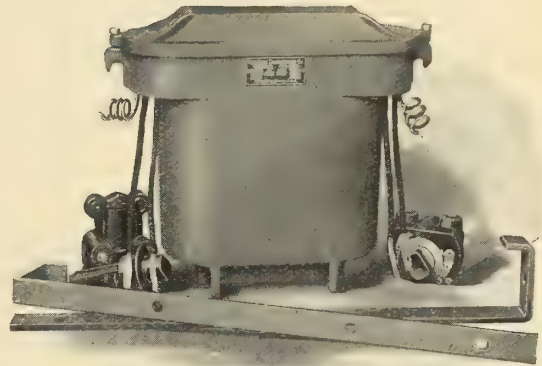
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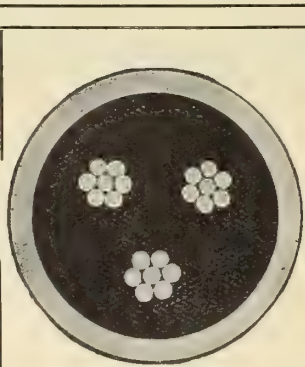
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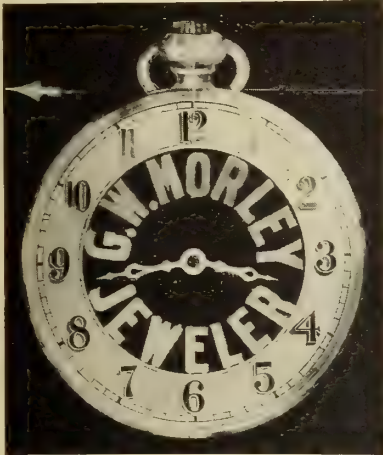
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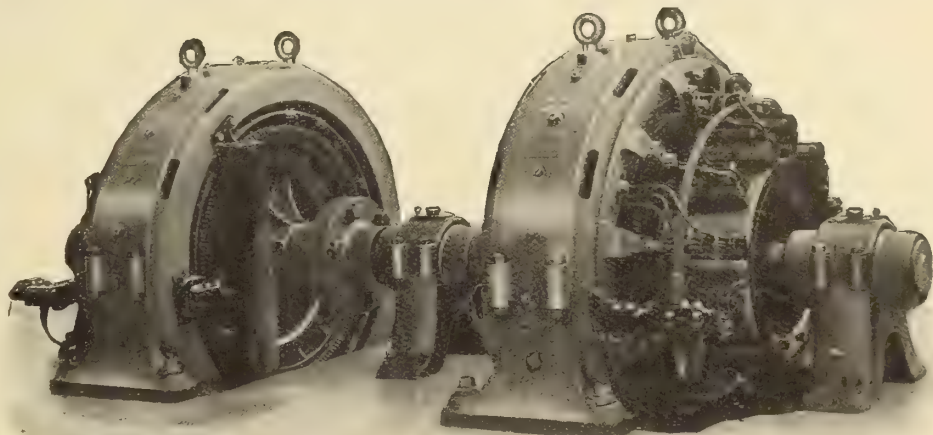
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## Current News

## Creston, B.C.

The Goat River Power & Light Company proposes to construct a power plant on the Goat River Canyon and will furnish electricity for lamps and motors and other purposes. The company also plans to construct an electric railway to extend from Creston to the Goat River, ten miles in length, work on which will commence within a year. The officers of the company are: R. S. Lennie, of Nelson, B.C., president; W. K. Essling, of Rossland, B.C., vice-president; J. B. Anderson, of Trail, B.C., secretary and treasurer, and W. F. Teetzel, Nelson, B.C., general manager.

## Ferne, B.C.

At a recent meeting of the City Council tenders were accepted for the construction of pole line distribution and machinery in connection with the municipal electric light system.

## Hamilton, Ont.

Preparations are being made by the Cataract Power Company for the new lighting contract which goes into effect July 1. Additional lamps are to be installed. It is said that there will be no gas lamps used after July 1.

## Lethbridge, Alta.

The Alberta Government has decided to install an automatic telephone system here. Address W. H. Cushing, Minister of Works.

## Niagara Falls, Ont.

The Hydro-Electric Commission will erect a large transformer building at Falls View. The Niagara Falls Power Company, Buffalo, N.Y., have concluded financial arrangements for carrying out additional construction on the Canadian side of the river at a cost of \$4,000,000.

## Peterborough, Ont.

The line for the electric railway between Cobourg and Peterborough has been surveyed from Cobourg to Rice Lake, and will be completed to Peterborough in a few weeks. It is expected that contracts for the construction of the road will be let shortly.

## Victoria, B.C.

The British Columbia Electric Railway Company is seeking to increase its water supply. The company proposes to secure an additional 25 cubic feet per second and construct a dam and power house near the mouth of the Jordan river.

## Winnipeg, Man.

The date for receiving tenders for machinery in connection with the hydro-electric power development at Pointe du Bois has been changed from August 16th to August 2nd.

## AWARDED.

## Lethbridge, Alta.

Contracts for the construction of the municipal electric light plant have been awarded as follows: For mechanical draft and economizer to the Polson Iron Works, of Toronto, Ont., for \$6,890; complete piping to Drummond, McCall & Company, of Montreal, Que., for \$14,365; for crane to Mussels Limited, for \$1,700; boilers and accessories to the Babcock & Wilcox Company, of Montreal, Que., for \$25,410; feed pumps to the Canada Foundry Company, of Toronto, Ont., for \$730; transformers to the Northwest Electric Company, of Calgary, Alta., for \$1,320; electrical equipment to the Canadian Westinghouse Company, of Hamilton, Ont., for \$1,449, and to Laurie & Lamb, of Montreal, Que., for engine and condensing sets, for \$18,575.

## Mountain, Ont.

The contract for the construction of two reinforced concrete arch bridges and two reinforced concrete piers over the Castor river and McCaul creek was awarded to R. J. Dougall, of Hallville, Ont., at \$2,200. Engineers, Magwood & Walker, Cornwall, Ont.

## Princeton, Ont.

The contract for the construction of two cement abutments for steel bridge over the river Nith, Blenheim Township, was awarded to Andrew Bain, of Embro, at \$5.20 per cubic yard. The contract for the cement floor was awarded to the Hamilton Bridge Company, at 28 cents per foot.

## Toronto, Ont.

The Board of Control has awarded the contract for lighting the newly annexed district of Wychwood to the Toronto Electric Light Company at a rate of \$69 per lamp per year.

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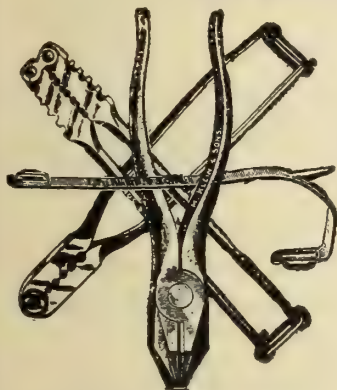
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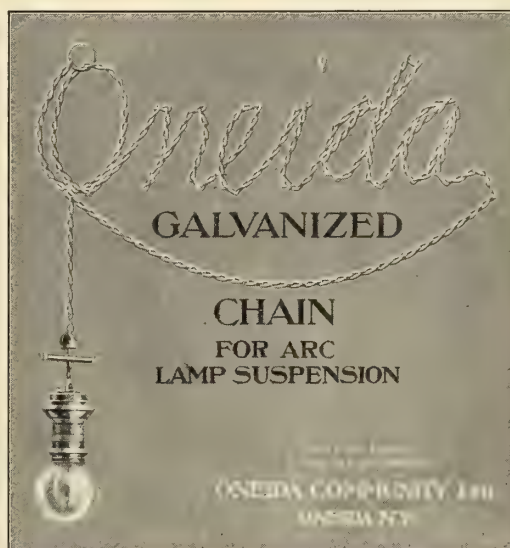
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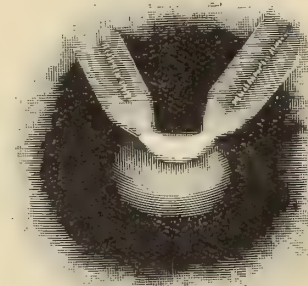
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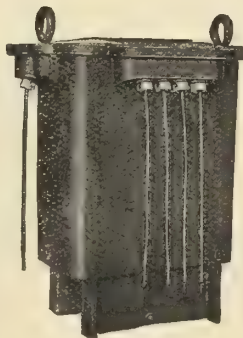
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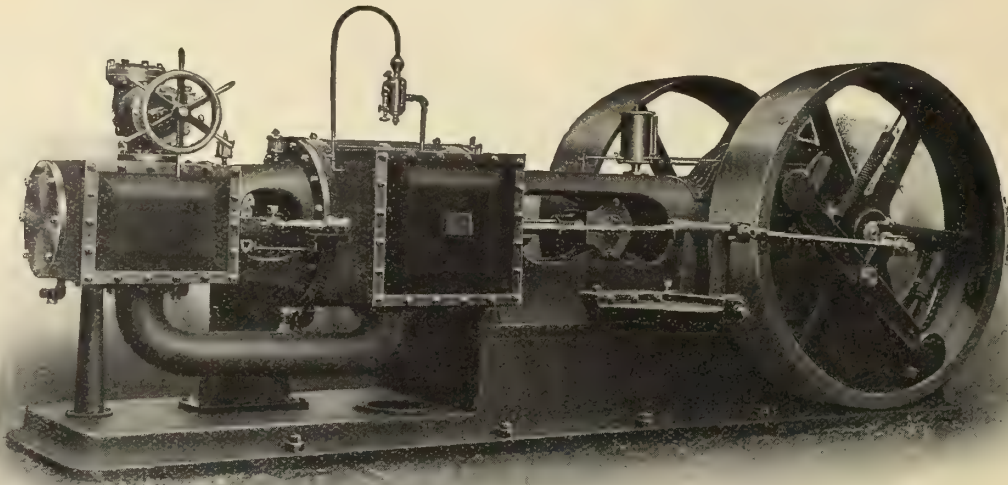
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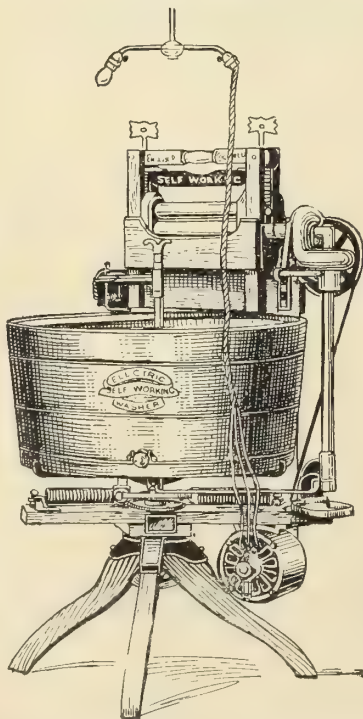
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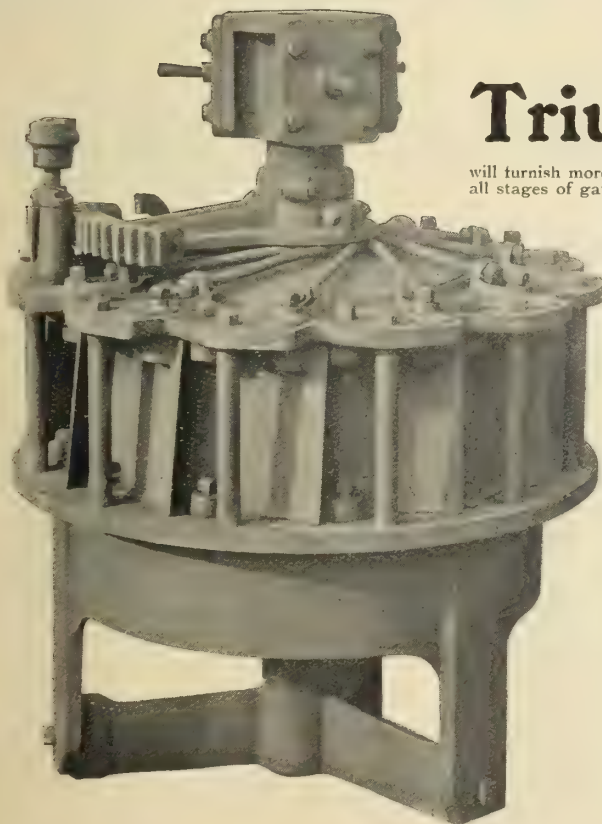
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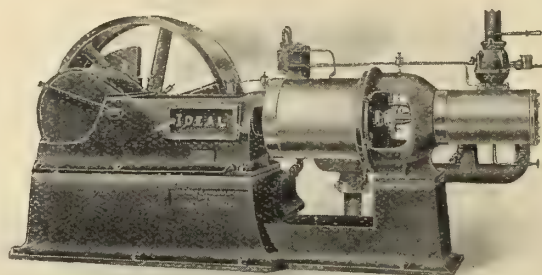
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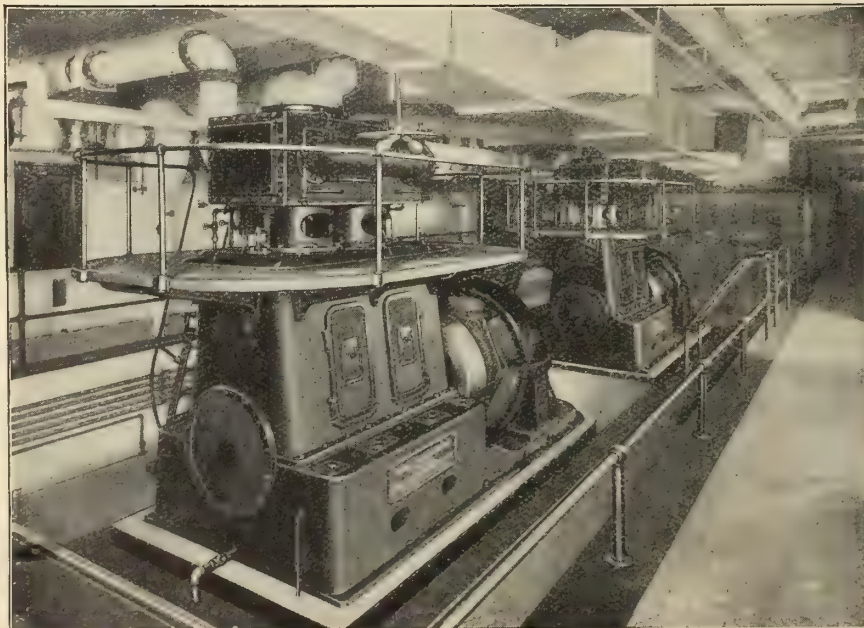
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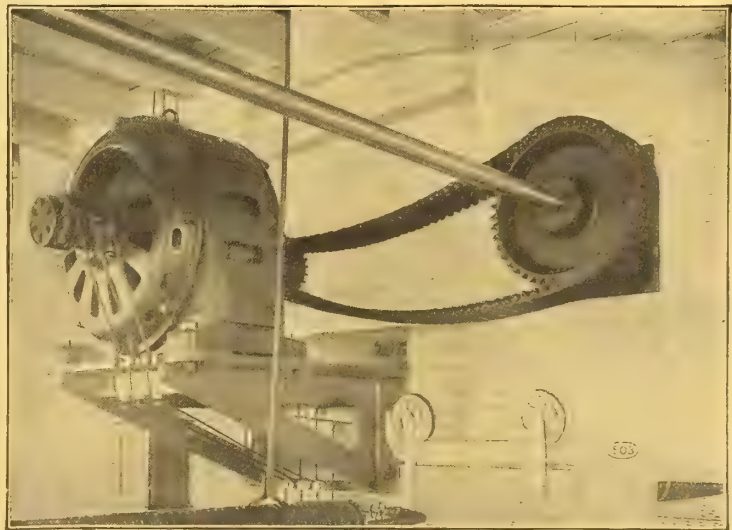
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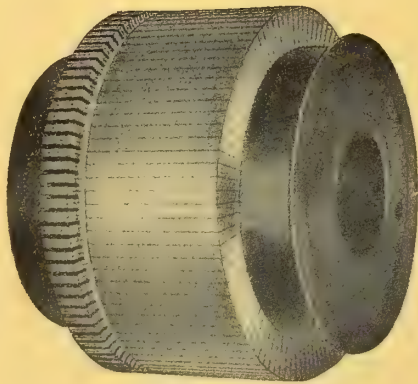
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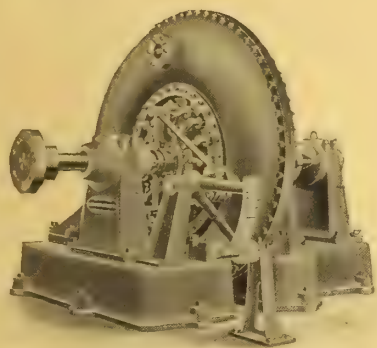
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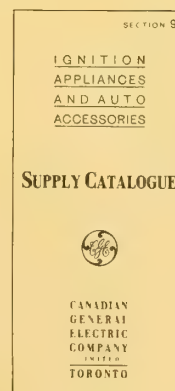
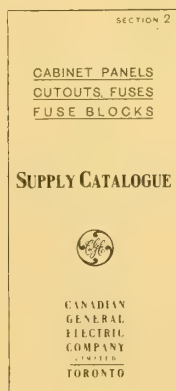
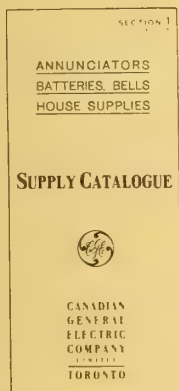
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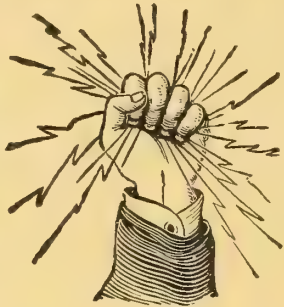
The new lines now added will be of interest

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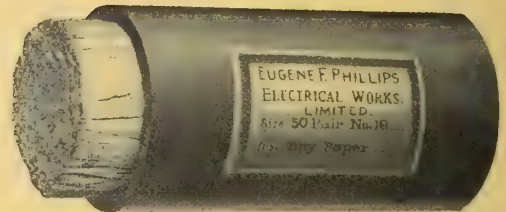
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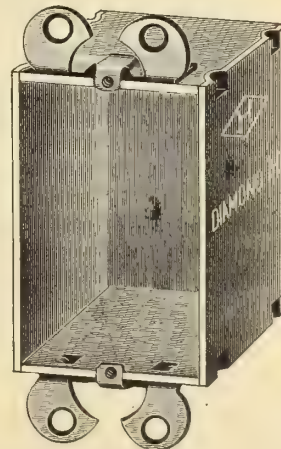
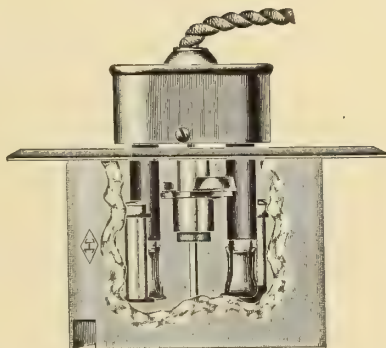
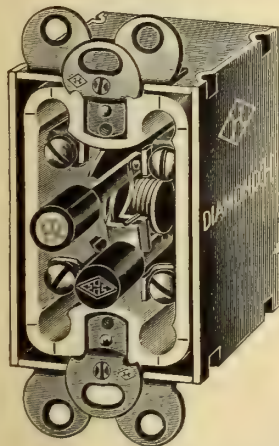
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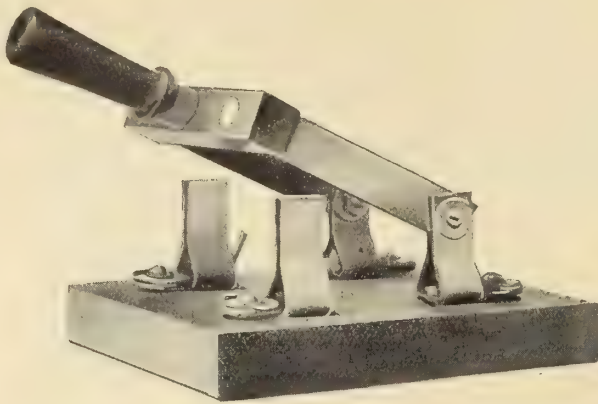


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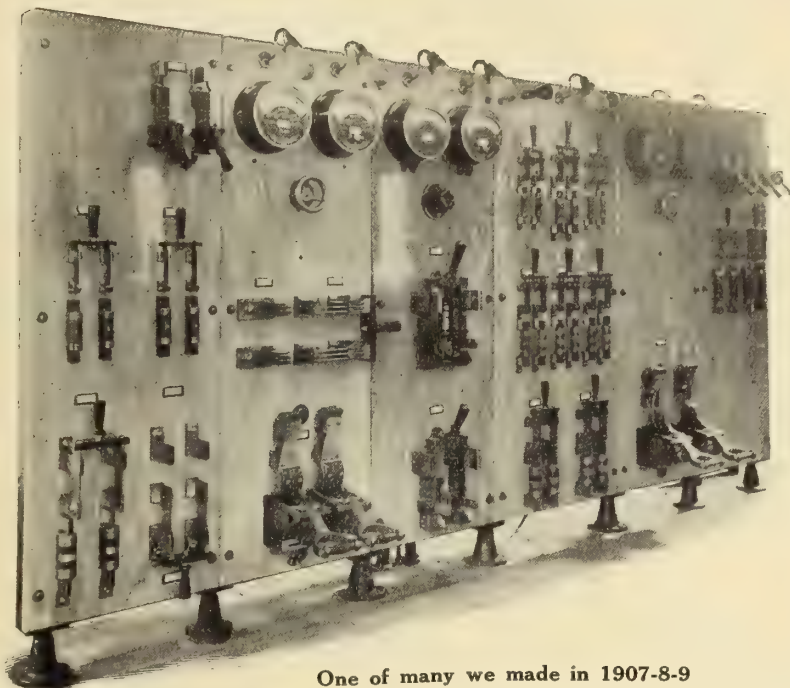
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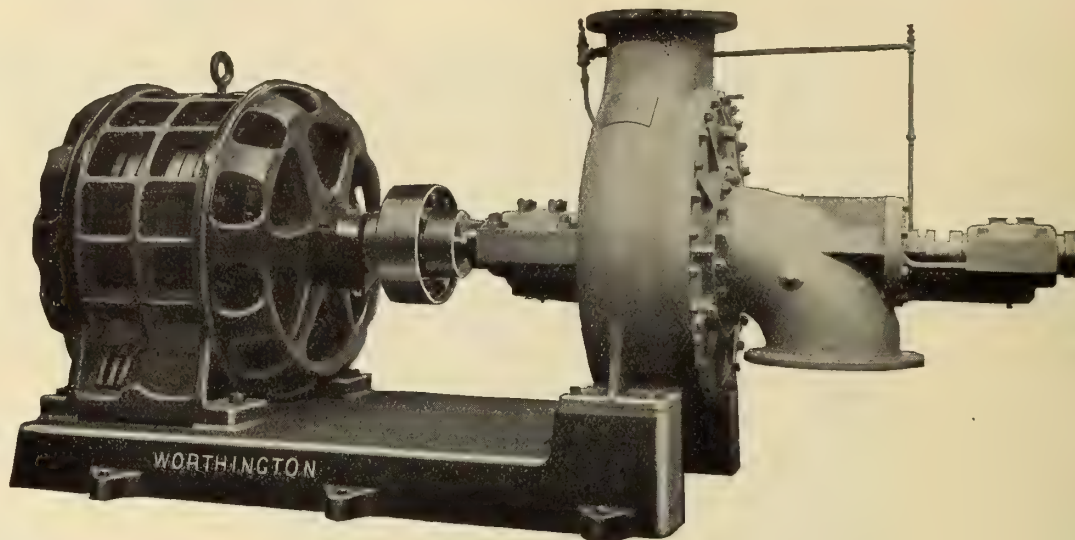
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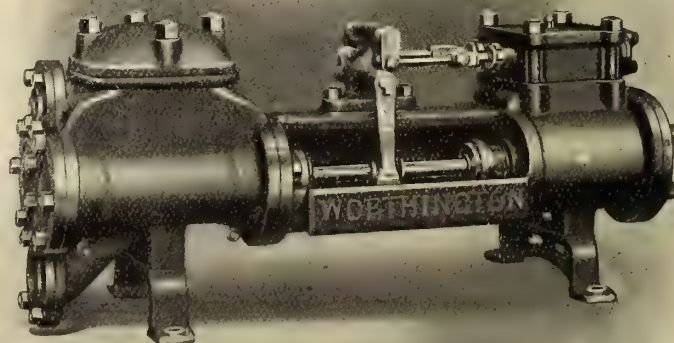
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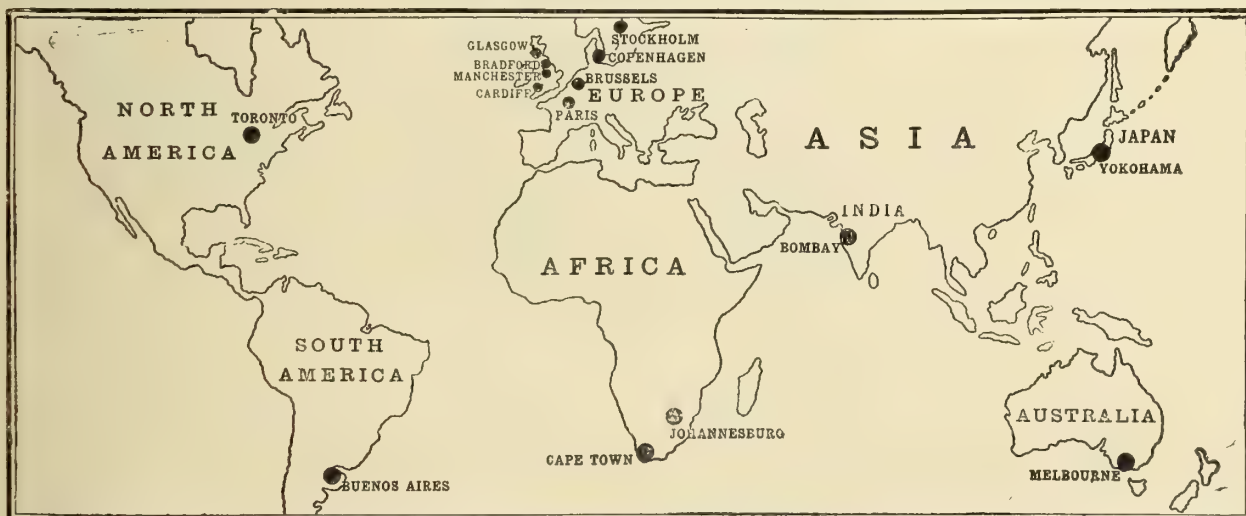
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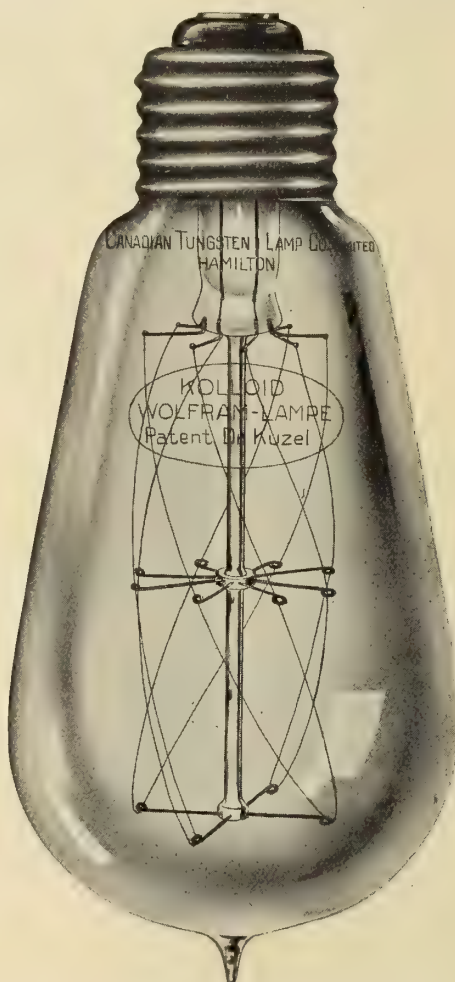
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Burns  
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Angle

Alternating  
or Direct  
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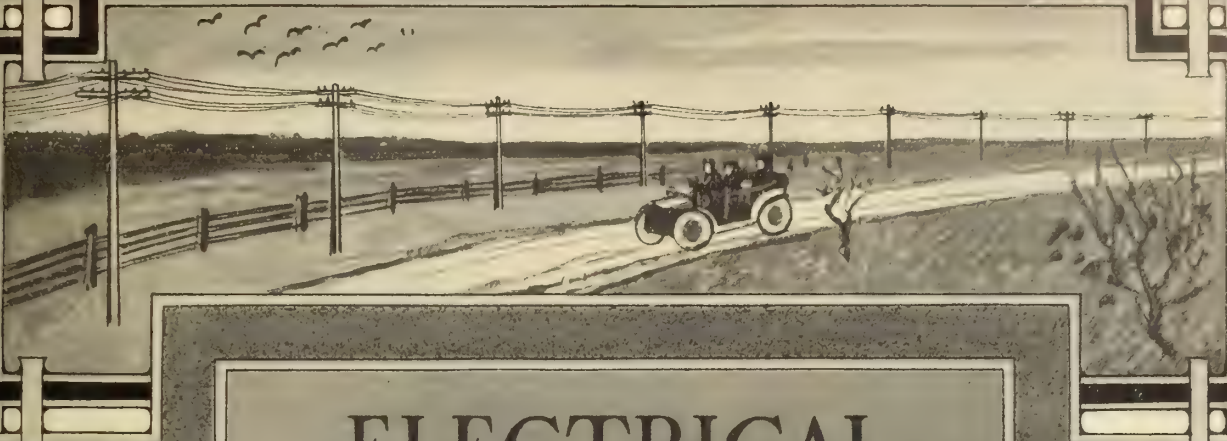
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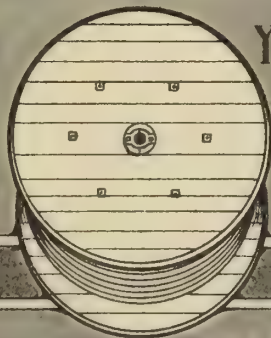




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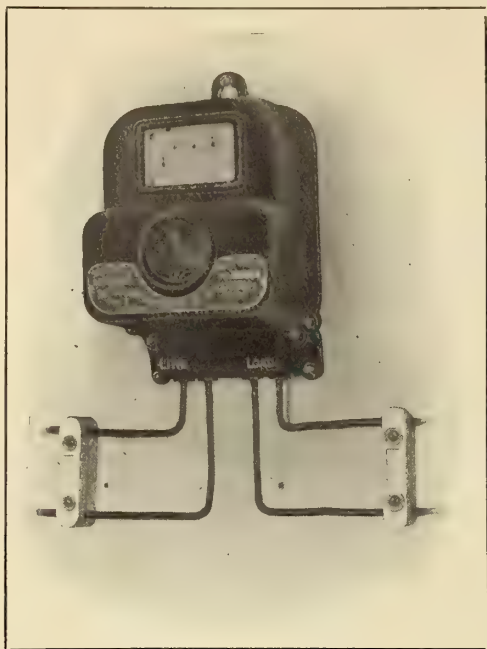
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All lengths always in stock and shipped direct from our yards in Canada

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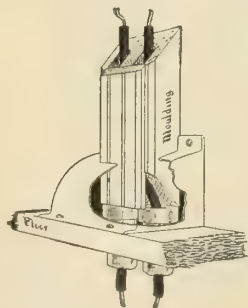
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Manufacturers of Standard Quality Telephones and Switchboards, Complete Exchanges

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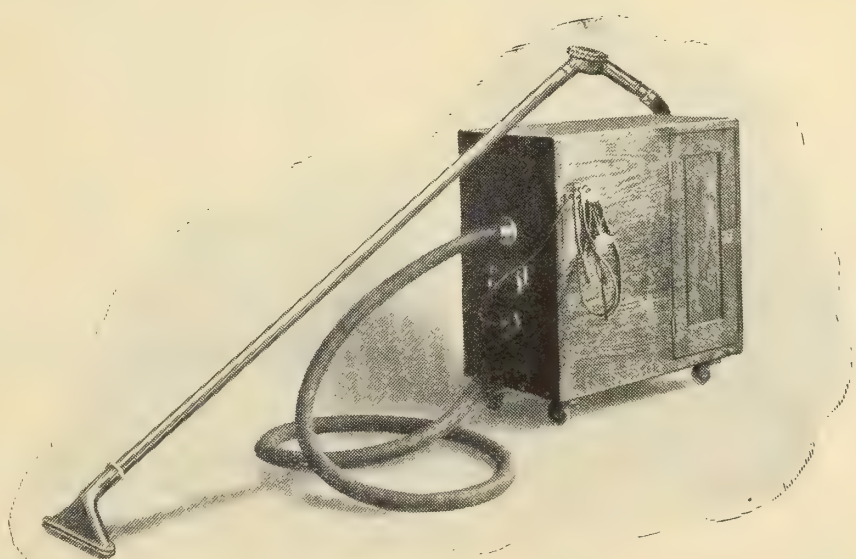
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¶ It's *light*, simple in construction and runs *smoothly*, making its use a *pleasure*. The Portable Positive is a constant *invitation* to consume juice.

¶ Most important of all—the Portable "**Positive**" does its work *thoroughly*—precludes *all possibility* of the ill feeling against your company that always is engendered *unless* the appliance you recommend gives *absolute satisfaction*.

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Neatness in Design

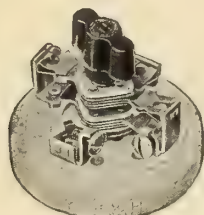
Reliability of Operation

Durability of Mechanism

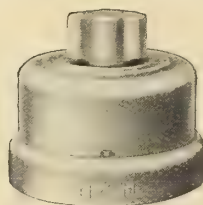
are all combined in

## H and H Snap and Flush Switches

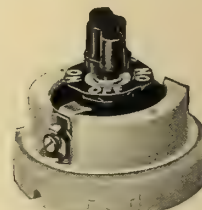
### Snap Switches



250 Volt  
5 ampere 3 way



250 Volt  
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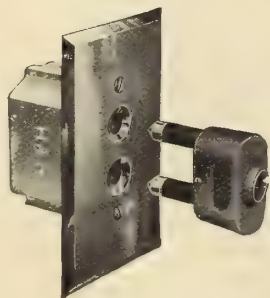


### Push Button Switches

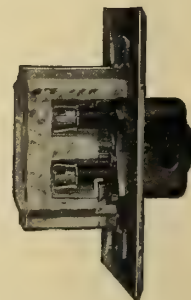


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**Thoroughly Insulated — Easily Operated**



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Its Practicability, Convenience and Economy  
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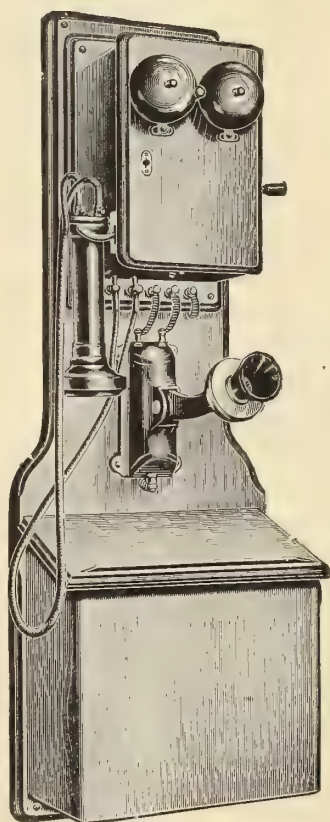
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# Tungstoliers

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will manufacture and sell a complete line of their celebrated TUNGSTOLIERS, Electric and Gas Fixtures, embracing the necessities of the entire commercial and residential fields.

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**Kindly send for our Catalogue and Prices  
and let us figure on your requirements**

# The Tungstolier Company

**E. V. HENNECKE, Vice-President**

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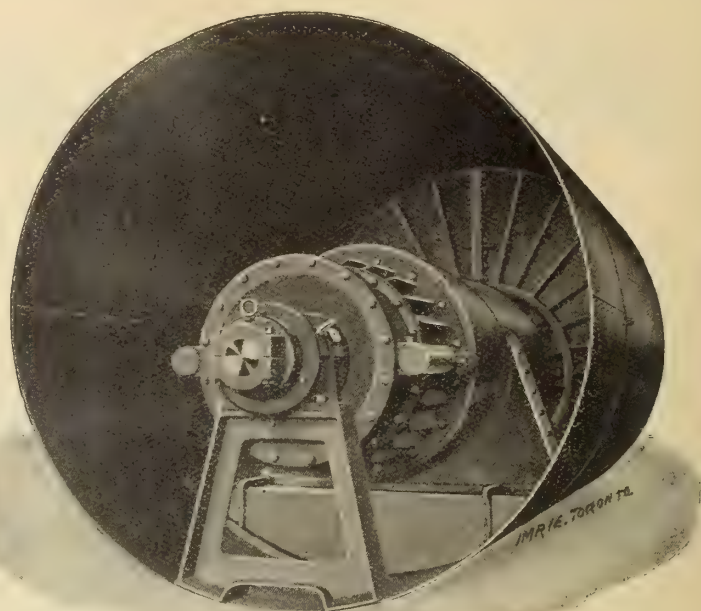
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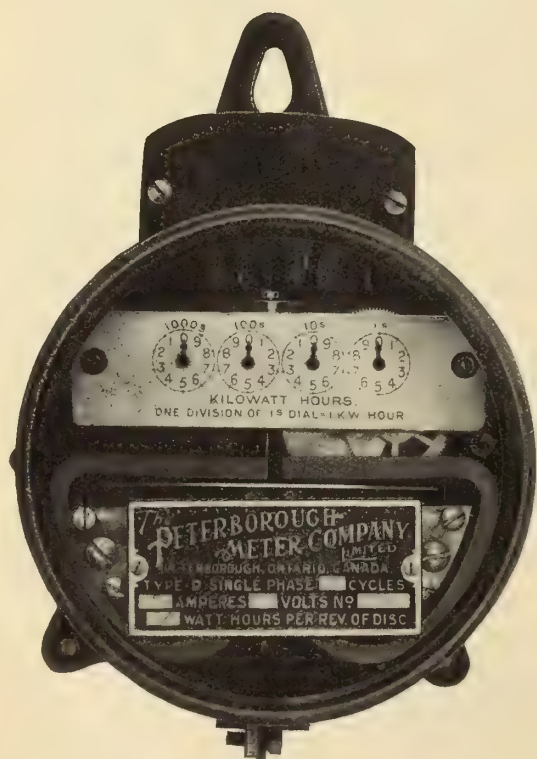
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# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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### EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 8

Toronto, August, 1909

No. 8

## Operation of Public Utilities

Professor Shortt's significant arraignment of Government operation of public utilities, a brief report of which appears in these columns, should not remain unheeded by a too apathetic public.

Such a speech, coming from one who has devoted much patient study to an investigation of the true existing conditions and who undoubtedly has the best interests of the public at heart, should sound a note of warning to municipalities on the brink of taking such a step.

Professor Shortt, while he maintains that public regulation of a municipal franchise is desirable, further believes that the operation of such by the municipality cannot be successful. Our system of municipal politics bars forever the public operation of these utilities.

Private operation must be protected by a monopoly. Unless this is the case it will never give public satisfaction. Extensions and improvements must be made, but not by inviting a ruinous competition.

Professor Shortt notes a difference between Public Ownership and Public Operation that is not made by the average citizen. The former conveys to a majority a summation of both ownership and operation, which is erroneous. While many are believers in municipal ownership they hold with Professor Shortt that public operation of utilities is detrimental to a public's interests.

## Possibilities of the Bituminous Producer

Up to the present time the bituminous gas producer has not been a seriously considered competitor of the steam plant in central station work, but this must be attributed to its lack of introduction to the commercial market rather than to its failure to make good under test. Competition, if any, has been between the steam engine consuming soft coal and the anthracite producer, with the success of either regulated largely by the relative prices of the fuels themselves.

The success obtained by Mr. W. P. Flint in a series of experiments, particularly with the bituminous producer, is given in full on another page of this issue, and open up a new vista of possibilities for this type of engine. According to Mr. Flint the successful operation of the gas engine in the future will depend upon the definite knowledge of its economies at various loads. Another point that becomes axiomatic from a study of the curves submitted by Mr. Flint is the necessity for operating the engine at a load equal at least to half the corresponding rating.

Mr. Flint has confined his investigation to the smaller units, and from the fact that small sizes are equally efficient when compared with the larger units, it would seem that the gas engine offers more inducement for investigation, to the small central station, than to the station where larger engines would be required. The question of whether the gas will supercede the steam engine in small plants assumes a different aspect with the entrance of the bituminous producer into the field. With only the anthracite producer as a contending force the problem was reduced to a comparison of the cheaper first cost per kilowatt produced, per unit, of the steam engine and boiler, with the higher first cost, but much greater fuel economy of the anthracite producer plant. The success of either (as before mentioned, depending largely on the relative costs of soft and hard coal in the particular locality in which the installations were made.

Just now in Canada several installations of gas producer units are being made under a rigorous guarantee of low power cost, and the question of whether the low cost of production per k.w. hour will be advantageous to the central station when the extra first cost of installation is taken into account will be studied with interest.

## Guarantee of Electrical Devices

The guarantee system employed by the Union Electric Light & Power Company, of St. Louis, in the sale of electric irons is working out very successfully according to Mr. W. H. Wissing. He describes elsewhere in this issue this company's methods of operating their selling department. In brief, they place these irons out on the usual 30-day trial plan, but if satisfactory the customer purchases his iron at a net price of \$6 for a six-pound iron. This is considerably higher than the customer would pay if he bought it from a local departmental store, but he receives from the power company a guarantee to assume the responsibility of keeping the iron in perfect repair free of all further expense to him, that more than compensates the higher figure he pays for it. The good sound business method underlying this transaction should recommend itself very strongly to the central station manager.

A charge is made in this case that not only enables the central station to make, without loss, all the necessary repairs to the iron during its life, but has the added advantage of lessening the worry and inconvenience to the customer.



# Government's Relationship to Public Utilities

## Professor Adam Shortt's Important Remarks on a Live Issue—Municipal Operation not Advisable

Professor Adam Shortt, of Queen's University, Kingston, who is too well known in Canada, as a deep and unbiassed public thinker, to need any introduction of ours, was recently the guest of the Fort William, Ont., Canadian Club. He chose a particularly interesting topic for discussion and his terse remarks on "Relation of Government, Whether Municipal, Provincial, or Dominion, to Public Utilities," are worthy of more than a passing notice in these columns.

Public utilities, as pointed out by Professor Shortt, have developed in importance proportionately with the growth of the country. Railroads, waterfalls, water supply, and telephones, now vital public utilities, were not so regarded by early Canadian settlers.

The vast distinction between such public utilities as electric power or railroads and the water supply, lies in the absolutely unification of the public's interests in the latter. In railroading and electric lighting a service is furnished, and charged for accordingly. The water supply, on the other hand, involves many issues, such as fire protection, the obtaining of pure water, and other considerations of corporate interest that should be taken care of only by the corporation.

"Is not the railroad system of a country as vital to the interests of the country as the fire protection to the interests of the town?" asks Professor Shortt, and then answers it as follows: "Yes, on the large scale, but it does not follow that the Government must own and operate the railways as a government of a civic corporation must own, operate and regulate its sanitation and water supply." Continuing, he outlined the big distinction between the monopoly of a public utility, of which there is a limited supply, such as coal or lumber, and a monopoly due to purely business conditions. The case of a waterfall is an example of the latter monopoly. To develop it requires capital, but there is nothing to prevent several companies from obtaining capital and also developing power. It is not advisable, however, from a business standpoint to have more than one company tearing up the streets to put down tracks or to erect transmission lines. The interests of the public, therefore, lead to the granting of a monopoly in the shape of a franchise. The danger lies in the exercise of the monopoly.

There are three possible attitudes to the handling of a monopoly, namely: Public ownership, public operation, or public regulation of the monopoly. The speaker considered it necessary for the Government to regulate but not necessary for the Government to own a public utility. In the case of a waterfall, the capital was free and if the power developed was to be utilized for manufacturing, transportation or other public benefit, a franchise should be awarded either to an individual or to a limited corporation.

"There is a wide difference between public ownership and public operation. The first is simple, the latter extremely difficult," continued Professor Shortt. "Public ownership of a water power is simply the holding of that, as the original and permanent owner of it. To develop it, sell the product, collect rates, and to go through all the details, keeping up to date with the changes in the use of it is a different matter, which leads to flexibility which a public body seldom has. More-

over, there is the need of a continuity of management; whereas public ownership means simply permanent holding.

"Now, if the government is the owner, it has a permanent hold upon the use made. It can lease, under arrangements for a certain time, to be operated; but it can always come in, if that arrangement is violated, and resume ownership, and transfer the operation to others. It may have to make a new bargain when the period has elapsed. But that is a question of dealing with the matter when the public has its chance of determining for the future. So the question of control is a simple thing, but operation is a difficult matter.

"A government should operate as little as possible. If a government is operating, it puts itself out of power to adequately control. The government has to sell, to justify itself; and in doing so it has not a free hand to regulate and keep it up to date and keep it going. It has not the opportunity to criticize an unwise use of a thing. Supposing a corporation takes over a lease of a water power that belongs to the government and makes a bad use of it, charging excessive rates and dealing unfairly with the individual. The public can always come after them and follow them up and see that they deal fairly. But if the public body itself is making those bargains, and distributing it, and are dealing unjustly and wasting money, and having to charge excessive rates in order to make up for what is wasted, is that body in a position to independently and freely and decently criticize itself? No! That body is simply in a position to cover up its tracks whenever it can, and as long as it can; and moreover, when it is a body dependent on the public for re-election there comes in the vital difficulty in many ways. The general public is physically and mentally incapable (without criticism of men's honesty or faculties) since the most astonishing genius that ever lived could not make himself familiar with all the details of operation of these systems.

"It is not a question of statistics. I have gone through piles of statistics, on the success or failure of municipal operation and government operation. There is no more misleading mass of stuff on earth than those statistics. In nine cases out of ten you have a set of figures that so much was invested and so much was the annual return. But you want to know all the book-keeping. You want to know how much it is drawing on the original capital, how much it is drawing on the increased value, and not for a year or two."

Continuing, he said: "I wish to express the conviction that a democratic institution is not capable of carrying on a business for municipality or province or dominion. What hold it should have on it is another matter. A community should not part with its natural franchises, whether it is laying cars under the ground, on the ground, or transmitting electric light through the air. It should always hold these. But it should vitally distinguish between its absolute hold for all time, and the liberty it may give to capital to come in and operate, and the freedom it has, to regulate that operation, if it is itself not responsible for the operation. Let public interest play around the thing and criticize with the utmost freedom, which it cannot do if it is vitally tied up in the operation."



# New Electrical Standardizing Laboratory at Ottawa

## Rules to be observed by Central Stations and others—Tariff of Fees for Correction of Instruments

The Electrical Standardizing Laboratory in the Department of Inland Revenue at Ottawa is now prepared to receive electrical instruments for examination or testing. This new departure will be a welcome addition to the engineering department at Ottawa, and it is to be hoped that all central stations will make every use of the advantages that will now be afforded for keeping their instruments in standard form. The department ask that the following rules be observed.

"All instruments submitted to the Department for comparison or standardization must be accompanied by a form of application which can be obtained from the Laboratory or from Inspectors of Electricity. The particulars as to the test required should be carefully specified on the application form. "Instruments will not be received which are not plainly marked with the name of the manufacturer and an identification number.

"Every instrument submitted must be provided with suitable terminals or leads, so that it can readily be connected to the testing circuit without soldering.

"All indicating instruments must have their dials plainly marked by a suitable scale calibrated in electrical units showing their capacity or range.

"The Department or the officers of the Laboratory will not be responsible for any damage to instruments, either in transport or while at the Laboratory, nor for any loss sustained in consequence of the time that may elapse before the instrument is returned.

"The laboratory charge on any instrument according to the subjoined tariff of fees may be paid by marked cheque, postal or express money order made payable to the Chief Electrical Engineer, Inland Revenue Department, Ottawa.

The tariff of fees to be charged is as follows:

1. For an instrument intended to be used as sub-standard for special examination and testing .....\$15.00  
If required to be kept under observation for a period longer than one month, for each additional month or part thereof ..... 5.00
2. For ordinary direct reading instruments:  
Voltmeter for continuous current only:  
Not exceeding 200 volts ..... 1.25  
Exceeding 200 volts and not exceeding 500 volts ..... 1.50  
Exceeding 500 volts ..... 2.00  
Voltmeter for alternating pressure only:  
Not exceeding 200 volts ..... 1.25  
Exceeding 200 and not exceeding 2,000 volts... 1.75  
Exceeding 2,000 ..... 2.50  
Voltmeter for both continuous and alternating pressures or for alternating at two frequencies:  
Not exceeding 2,000 volts ..... 2.50  
Ammeter for continuous current only:  
Not exceeding 200 amperes ..... 1.25  
Exceeding 200 and not exceeding 500 amperes.. 1.75  
Exceeding 500 and not exceeding 1,000 amperes.. 2.50  
Exceeding 1,000 and not exceeding 2,500 amperes 3.75  
Ammeter for alternating current only:  
Not exceeding 500 amperes ..... 1.75  
Exceeding 500 amperes ..... 2.50  
Ammeter for both alternating and continuous currents:  
Not exceeding 500 amperes ..... 2.50  
Wattmeter for continuous current:  
Not exceeding 200 volts or 200 amperes ..... 2.00  
Exceeding these limits up to 2,000 volts or 2,500 amperes ..... 3.75  
Wattmeter alternating current:  
Not exceeding 200 volts and 100 amperes ..... 1.50  
Exceeding these limits ..... 55.00  
In the case of any direct reading instrument of arranged to record, and if the accuracy of such record is required to be verified:  
Extra fee for every record verified ..... .75
3. For determining the constants of integrating-meters:  
Quantity meter, continuous current only:  
Up to a maximum of 25 amperes ..... 2.50

- |                                                                                                                                                                                        |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Exceeding 25 and not exceeding 100 amperes ...                                                                                                                                         | 3.75  |
| Exceeding 100 and not exceeding 500 amperes....                                                                                                                                        | 5.00  |
| Exceeding 500 amperes .....                                                                                                                                                            | 7.50  |
| Quantity meter alternating current:                                                                                                                                                    |       |
| Up to a maximum rate of 25 amperes .....                                                                                                                                               | 2.50  |
| If to be tested at two frequencies or at one frequency and with continuous current .....                                                                                               | 3.75  |
| Exceeding 25 and not exceeding 100 amperes at one frequency of alteration .....                                                                                                        | 3.75  |
| If to be tested at two frequencies or at one frequency and with continuous current .....                                                                                               | 7.50  |
| Exceeding 100 and not exceeding 500 amperes if tested at one frequency .....                                                                                                           | 5.00  |
| If to be tested at two frequencies or at one frequency and with continuous current .....                                                                                               | 7.50  |
| Energy Meter, continuous current only:                                                                                                                                                 |       |
| Up to maximum rate of 10,000 watts .....                                                                                                                                               | 3.75  |
| Exceeding 10,000 and not exceeding 50,000 watts                                                                                                                                        | 5.00  |
| Exceeding 50,000 watts .....                                                                                                                                                           | 7.50  |
| Energy Meter, alternating current:                                                                                                                                                     |       |
| Up to a maximum rate of 20,000 watts—if to be tested at one frequency .....                                                                                                            | 5.00  |
| If to be tested at two frequencies or with continuous current .....                                                                                                                    | 7.50  |
| Exceeding 20,000 watts—if to be tested at one frequency .....                                                                                                                          | 7.50  |
| If to be tested at two frequencies or at one frequency and with continuous current .....                                                                                               | 10.00 |
| 4. For testing resistances and standard cells:                                                                                                                                         |       |
| For a resistance coil of not less than 1 ohm resistance to an accuracy of 0.1% .....                                                                                                   | 1.25  |
| For a resistance coil of resistance between 1 ohm and 1-1,000 ohm to an accuracy of 0.1% .....                                                                                         | 1.25  |
| For a box of resistance coils with wheatstone bridge to an accuracy of 0.1% per coil tested .....                                                                                      | .10   |
| With a minimum charge of .....                                                                                                                                                         | 1.00  |
| For a coil of standard form to highest accuracy obtainable at one temperature .....                                                                                                    | 2.00  |
| For determining the E.M.F. of a Weston or Clark standard cell at one temperature .....                                                                                                 | 1.25  |
| For testing resistance and standard cells at two different and stated temperatures the fee to be charged will be double that specified above.                                          |       |
| 5. For testing the candle power and energy consumption of incandescent lamps:                                                                                                          |       |
| For sample lots of six lamps or less .....                                                                                                                                             | 1.00  |
| For sample lots exceeding six lamps, each lamp....                                                                                                                                     | .15   |
| For testing standard incandescent lamps used as standards in photometer work, each .....                                                                                               | .50   |
| 6. For a conductivity test of a sample of copper or other wire .....                                                                                                                   | 2.50  |
| 7. Adjustments to zero will be made on instruments when necessary, but structural repairs cannot be undertaken. A calibration curve of the reading of an instrument will be furnished. |       |

## New Schedule of Meter Verification Fees

A splendid service was rendered to the different operating companies, both in the gas and electric field, by the committee of the Canadian Electrical Association, appointed to obtain a reduction in the rates charged for the verification of meters. The report of this committee at the Quebec convention was published in the July "Electrical News," and we publish below the schedule of rates, effective on July 1st, solely through the efforts of this committee. Further than this, they obtained a promise of a further reduction at a later date.

- |                                                  |        |
|--------------------------------------------------|--------|
| 5-light meters and under .....                   | \$ .75 |
| Over 5-light meters and not exceeding 20 lights  | 1.00   |
| Over 20-light meters and not exceeding 40 lights | 2.00   |
| Over 40-light meters and not exceeding 50 lights | 3.00   |
| Over 60-light meters and not exceeding 80 lights | 4.00   |
| Over 80-light meters .....                       | 5.00   |



# The Modern Gas Engine in Central Station Work

## Showing the Economy at Different Loads of Various Anthracite and Bituminous Producers\*

BY WM. P. FLINT

The gas engine is not a panacea for all central station ills. It is, however, a very valuable instrument for the economic use of fuel in the production of power. The object of this paper is to make clear some of its possibilities, particularly when operated in connection with the bituminous coal gas producer, and to state facts which will enable each central station manager to see its application to his local conditions.

To get the best results from the gas engine, its economies at different loads must be known. The following data should be understood to be based on the performance of the particular make of engines with which the writer is most familiar. Referring to the left hand portion of Fig. 1, curve A & A<sup>1</sup> are to be read to the scale at the bottom and left, and curve B & B<sup>1</sup> to the scale at the bottom and right. Curves A & B are the average test performances of a number of 140 B.H.P. producer gas engines operating on producer gas. Curves A<sup>1</sup> and B<sup>1</sup> may be regarded as poor performance for size of engine and one which would call for correction by the operator. Curve B<sup>1</sup> may also be read as the probable good performance of a 10 h. p. 2-cylinder engine if we disregard the brake horse power scale and read the full and half load economies for the large engine as applicable to the corresponding loads on the small engine. Larger engines may be expected to show even better economies at corresponding fractions of their rating, than does curve A, but the betterment is not very great and may be disregarded in this paper. One of the characteristics of gas engine performance is the way small engines show almost equally good economy with large ones.

For the purpose of making the figures which follow correspond with results which may be relied on in commercial operation, they will be based on curve A<sup>1</sup> and B<sup>1</sup>. The lesson to be drawn from these curves is that the sizes and numbers of gas engines installed should be such as to permit shutting down any unit or units and transferring their load to others when it falls below one-half the rating. An engine which uses 11,400 eff. B.T.U. per BHP hour on full load, may be expected to use 35 per cent. more on half load and to fall off in economy very fast below half load.

At the right of Fig. 1 are shown the results which may be expected from a double fire zone bituminous producer. These are based on tests with different grades of coal extending over a year's time, each test representing from three to fifteen days' continuous operation. The standby loss shown on this sheet is much greater than necessary, as was proved by afterwards more carefully adjusting the draft. The producer was capable of delivering 1,900,000 eff. BTU in gas per hour continuously on Pittsburgh Run of Mine coal, averaging 13,300 BTU per pound as fired, and of delivering considerably greater quantities of gas for short periods of one or two hours.

When poorer grades of fuel, such as lignite, were used they could not be fired at greater rates per hour, and hence the output of the producer was reduced in proportion to the heat value of the coal. There was

some falling off in the heat value of the gas per cubic foot as the output decreased, but this was not serious so long as the load did not fall below one-quarter the rated output of the producer. An outline of the producer referred to above, is shown in Fig. 2. This producer consists of an upper and a lower section with an annular water-cooled offtake casting between them. The fire in the upper section drives off the volatiles and breaks up the resultant vapors by virtue of operating on the down draught principle. The fire in the lower section consumes the coke descending from the upper section and allows the ashes to free themselves from practically all fuel. The lower fire thus rests on a bed of ashes extending down into a water sealed basin. Ashes may be readily raked out from time to time without disturbing the operation of the producer. The relative rate of combustion of these two fires is controlled by a valve in each air supply pipe. This air is drawn in first through an air space in the top cover of the producer where it is warmed, and then through the steam space of the water-cooled offtake casting where it takes up automatically the amount of moisture required to control the temperature of the fuel bed and to properly enrich the gas.

The gas leaving the producer is practically free from tar, but contains some lamp black and dust which are washed out in the static washer shown in the centre of the illustration. The gas then enters a large elevated drum, from which it is drawn off by the motor-driven rotary blower which supplies gas at constant pressure through a regulating valve to the line leading to the engines. This regulating valve is operated by the small holder type regulator shown at the right of Fig. 2, and by-passes any gas not required by the engines back into the elevated drum where it mixes with the new gas delivered by the producer, and serves to even up the richness of the output. The producer thus operates under suction and the charging door may be freely opened to put in new coal or to inspect the fire without danger of escaping gas or disturbance of the quality produced. There is usually a momentary enrichment of the gas when the fire is poked and this is made harmless by being mixed in the mixing tank with gas of more average richness. Poking is required at intervals of from one to two hours to keep the fire bed uniform. Referring again to the right hand portion of Fig. 1, it will be seen that the producer efficiency remains fairly constant at about 70 per cent. over a wide range of loads, and that its standby loss is a very small per cent. of its capacity. The power required to operate the exhaustor is not more than about 2 per cent. of the output of the producer.

There are several other successful bituminous producers on the market, but the one described above embodies valuable features not found in them.

There are many successful anthracite producers on the market and they have the same characteristic of small standby losses and high efficiency over a wide range of load. In fact, tests made on a non-bituminous suction producer of about the same size, gave efficiencies ranging from 73 per cent. at one-half to 79 per cent. at full rate output. The producer used is shown

\* Paper read before the Canadian Electrical Association, Quebec Convention.



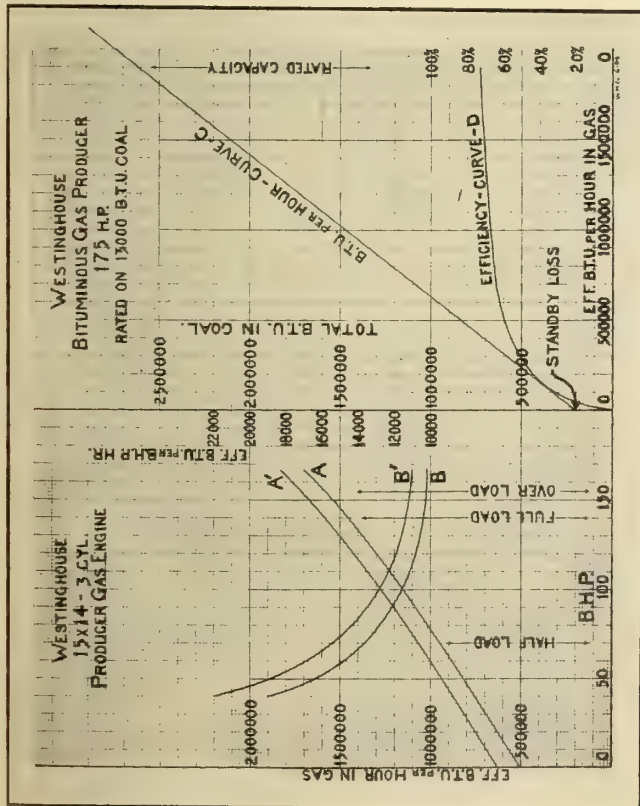


Fig. 1—Test Curves—Gas Engine and Producer.

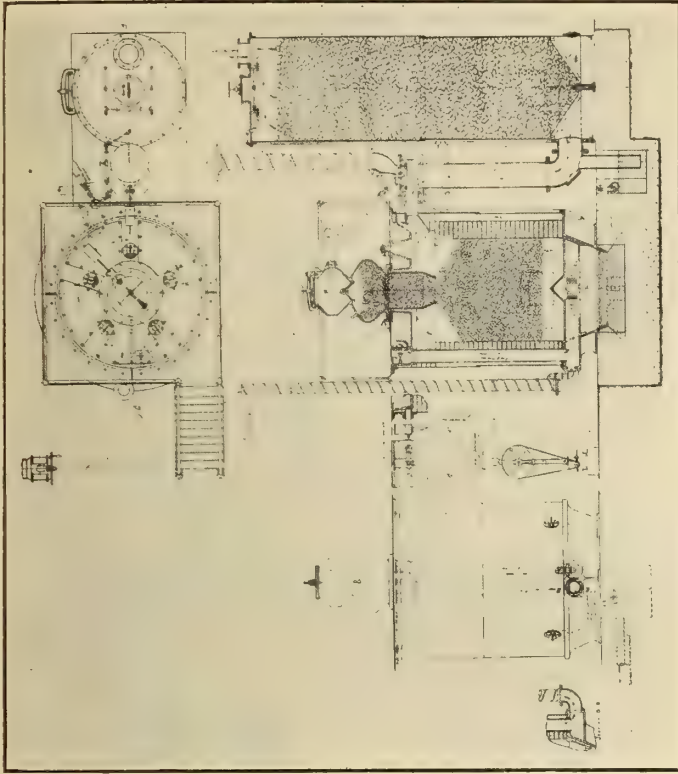
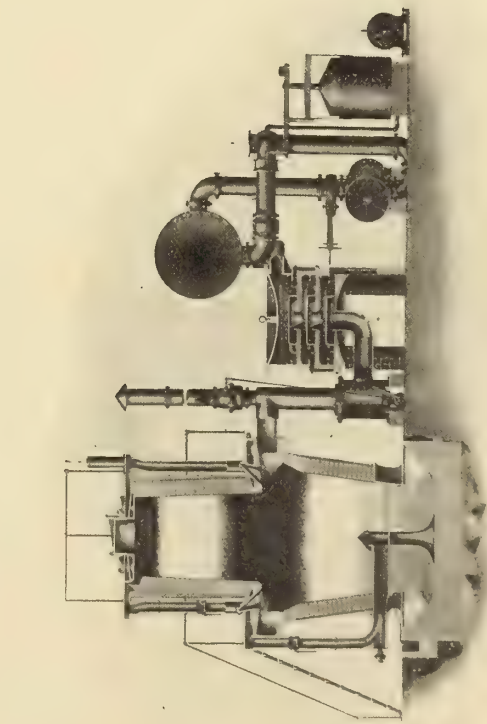
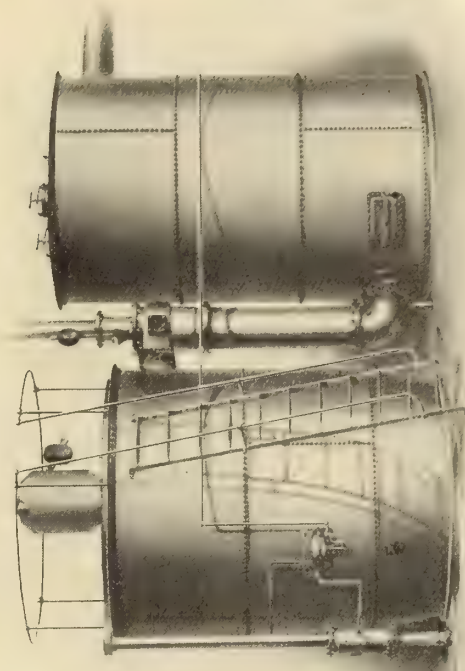


Fig. 3—Anthracite Suction Producer.

Fig. 2—Bituminous Double Fire Zone Producer.  
ILLUSTRATIONS ACCOMPANYING MR. FLINTS' PAPER ON "THE GAS ENGINE IN CENTRAL STATION WORK."Fig. 4—Anthracite Pressure Type Producer.  
ILLUSTRATIONS ACCOMPANYING MR. FLINTS' PAPER ON "THE GAS ENGINE IN CENTRAL STATION WORK."



in Fig. 3, and is of the up-draught suction type. It may be operated by the suction of the engine if desired, but where two or more engines are to take gas from one or more producers it is advisable to install a centrifugal fan to deliver the gas under pressure for the engines are easier started and will develop about 5 per cent. more power, which more than compensates for the power required by the fan.

An inspection of Fig. 3 will show that the steam required is made in the top plate of the producer which, like the one just described, has a water sealed bottom and requires no gas holder.

Fig. 4 shows a pressure type anthracite producer. The air is drawn into the base by means of a steam jet which affords sufficient pressure to overcome the resistance of the fuel bed and deliver gas to the line. This is a good arrangement where live steam is available, but if a small boiler has to be fired for the producer alone, its efficiency is usually so poor that its coal consumption is a material factor.

Where available at satisfactory price, natural gas is the ideal fuel. The engine cylinders are usually small-

This plant is located in the natural gas region and adopted gas engines about 10 years ago, and found they required about one-third as much gas as the boilers did which supplied their steam engines. Figs. 6 and 7 show the lightest and heaviest load conditions for the year 1906. The street arc light load is not included in these figures for it is a substantially constant load and is taken care of by two 125 h. p. gas engines driving 4-belted 50-light T.H. arc machines. In a more modern installation the arc lights would probably be operated from the AC buss bars and form a part of the general station load.

These extremes of load might well be handled by a plant consisting of three 175 h. p. bituminous coal gas producers, two 190 h. p. engines driving 130 k.w. alternators and two 100 h. p. engines driving 66 k.w. alternators. One of the larger engines and one producer would be held as a spare to guarantee continuity of service from the start and would stand ready to accommodate an increase of business. The first two columns, Figs. 6 and 7, show the loads for all hours of the day and night. The third column shows the units which should be running. The fourth column gives the average k.w. load and the k.w. hours. The fifth column gives the BHP load calculated from the average k.w. load by assuming suitable generator efficiencies. The remaining columns are figured with the aid of curves B<sup>1</sup> and C, Fig. 1, and give the total coal consumption and the coal per k.w. hour for the several load conditions. The results in this instance are 2.75 per k.w. hour for the day showing the lightest loads, and 2.11 per k.w. hour for the day showing the heaviest loads. It should be easily possible to run such a plant on an average of 2.5 per k.w. hour throughout the year.

It seems safe to assume that ordinarily the waste heat from the producers and engines would be more than enough to warm the power house even in the coldest weather, and this could be readily supplemented when necessary by burning producer gas in suitable stoves much as natural gas is burned in the Pittsburgh territory.

Under some conditions, probably rather uncommon in central station work, the storage battery is a desirable auxiliary to gas engines. For instance, a central station plant may have an opportunity to improve its load factor, particularly during the day, by selling 500 volt d.c. current to a small street railway company. The extreme fluctuations of this class of load would make it ordinarily most undesirable, for enough engines would have to be operated to meet the maximum demand and the average load would be a very small fraction of their rating. The storage battery is eminently fitted to even up the demand on the power house, particularly when equipped with a storage battery regulator which can be set to draw a constant current from the power supply and use it either to build up its own charge or to supplement its output to the line. Such a battery works at rapidly alternating and very high rates of discharge and charge. While its watt efficiency is probably not over 75 per cent., or including the transformer, rotary converter and booster, not over (75 x 97 x 92 x 95 per cent.) — 63 per cent., it has the valuable property of putting a steady average load on all other apparatus, with exception of its booster, back to the engine in the power house, and thus allowing a comparatively small engine running at or near full load to carry a load having peaks 2, 4 or even 6 times the mean. The first cost of such a battery and its auxiliaries will often be but a fraction of the cost of the engine, generator and other apparatus which would be required to carry the peak loads without the battery

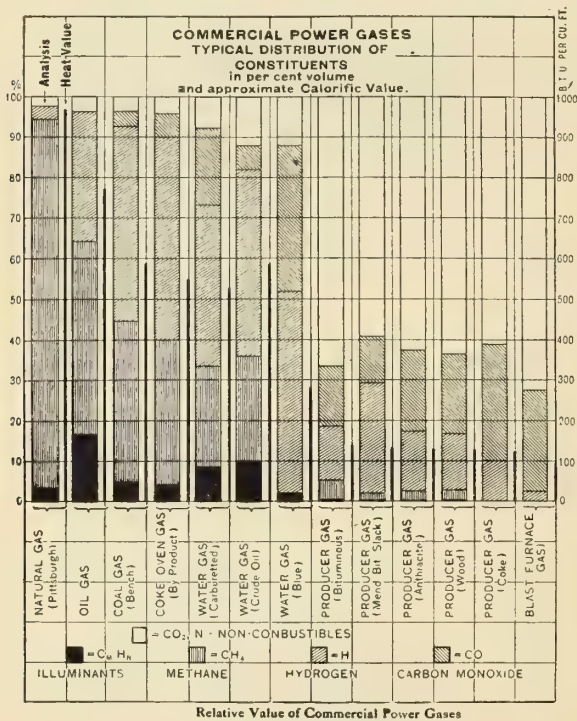


Fig. 5—Gas Composition Chart.

er for the same power than for producer gas, but the BTU consumption will be substantially as shown in Fig. 1, Curve B and B<sup>1</sup>. In this connection, Fig. 5 will be of interest for it shows graphically the constituents of the principal fuel gases. Those as a rule which contain a large proportion of nitrogen and CO<sub>2</sub> require enlarged cylinders and will stand higher compression than those containing little or no incombustible gas, but they give fully as high or higher efficiency in the engine.

The gas engine is so well known that it need not be described in detail at this point. The lantern slides following the paper will show some typical installations.

The use of the curves may be best brought out by assuming a central station load curve and figuring out the desirable engine sizes and method of operation. The load condition will be assumed to be that shown in the accompanying tables which are based on figures for 1906, obtained from the Bradford Electric Light and Power Company, through the courtesy of the general manager, Mr. J. H. Rose.





and the power losses with the battery will be less than without it by virtue of running the engine, generators, etc., at efficient loads.

Fig. 8 shows the regulating effect which may be obtained. The upper panel shows the external load which varies rapidly between the limits of 0 to 1,600 amperes. The middle panel shows the load on the power house which is adjusted about once every three or four hours, in order to control the degree of charge of the battery as indicated by a signaling hydrometer in the pilot cell. The lower panel shows the oscillation of charge and discharge currents in the battery which range from 1,000 amperes discharge to 600 amperes charge on a battery good for 240 amperes at the one-hour rate or 60 amperes at the eight-hour rate of discharge.

Again, a small central station may have a very small all-day load which necessitates keeping an engineer on duty, whose services for one shift night might be other-

sion lines. This latter work is being performed under difficulties, since on account of the rocky nature of the country blasting must be constantly resorted to.

The generating station will be located on a falls of the Matabitchouan river, two miles from where this river empties into Lake Temiskaming, and not far from the Montreal river. The Matabitchouan drains Rabbit lake, and at the point where the power plant will be situated has a head of approximately 312 feet. The line to Cobalt will be 24 miles in length and it is not the easiest matter to forward materials and supplies to the points where they are required. After reaching the Montreal river steamboat landing, they are conveyed by barge as far up the Matabitchouan as the river level permits, and the remainder of the journey is made by an overland route.

At the main generating station there will be installed four main units capable of developing 10,400 h.p. in all.

Water will be conveyed to these units through two steel penstocks, each 1,100 feet long, and each pipe will feed two of the main turbine wheels, which are of the single runner type, and enclosed in spiral cases. They will be operated at 600 r.p.m. and direct-connected to 1,500-k.w., 60-cycle, 3-phase, 2,400-volt generators. Two 125-volt, 475 r.p.m., 100-k.w. exciters, driven by impulse wheels, will supply the excitation for the generators. This apparatus is being supplied by Allis-Chalmers-Bullock, Limited. The water-wheel governors will be furnished by Jens Orten-Boving, of London, England, who furnished practically all of the hydraulic equipment for the 30,000-h.p. development at Loch Leven in Scotland, where there exists an extremely high head of 1,000 feet.

In the generating station, four 1,500-k.w. oil insulated and water-cooled 3-phase transformers will be installed to step the current from 2,400 volts to 44,000 volts for the 24-mile transmission to Cobalt, taking in Kerr Lake and South Lorrain mining camps on the way. In this transmission a double pole line will be employed in order to insure a continuous service. Each pole will carry a three-wire circuit, using stranded aluminum cable. A telephone circuit will also be attached to one of the lines. The usual overhead ground wire and electrolytic arresters in series with horn-gap switches will form the protection from lightning storms, and these arresters will be installed at the main generating station and at each of the three sub-stations.

In the Cobalt sub-station a total transformer capacity of 4,000 k.w. capacity will be installed, while apparatus of 1,000 k.w. capacity will be employed in the South Lorrain and Kerr Lake stations—to obtain the distribution voltage, which will be at 2,200 volts. Motor-driven turbine pumps in duplicate will be installed in the different sub-stations to provide the circulating water for cooling the high tension transformers.

Mr. E. A. Wallberg, C.E., is president, and Mr. F. John Bell secretary of this enterprising Cobalt company, while the firm of Smith, Kerry & Chace have the engineering interests in hand. It is fully expected that power will be delivered in Cobalt before the end of the present year.

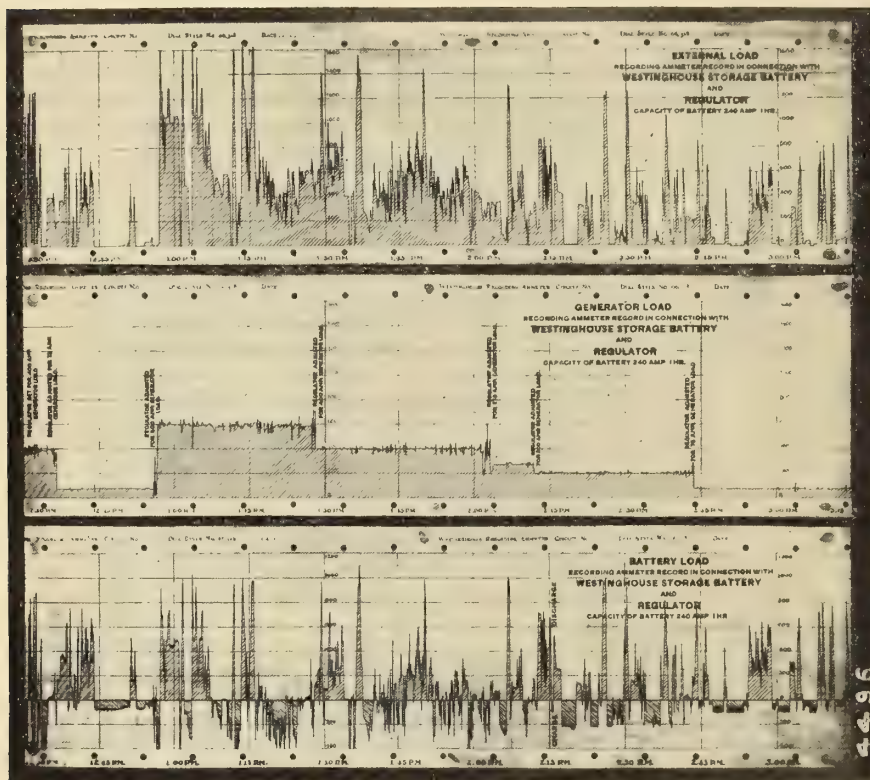


Fig. 8—Regulating Efficiency of Storage Battery.

wise dispensed with. In this instance, particularly if it is a direct current load, a battery may be installed to carry it, and the losses in the battery may easily be less than those involved in running an underloaded engine, particularly when the charging of the battery is made to bring up the load on the engines to one corresponding to good efficiency.

## The Plant of the Mines Power, Limited, Cobalt

The construction of a modern power plant and erection of transmission lines in the rocky wilds of a new country involves many unique engineering features and problems that are not encountered in ordinary practice. The generation and transmission which Mines Power, Limited, have undertaken for the purpose of supplying power to the Cobalt mining district forms a concrete example of the difficulties that are met with in such construction. This company's work is being rapidly proceeded with, and already considerable progress has been made with the dam construction and with the transmis-



# Annual Convention of the A. I. E. E.

The twenty-sixth annual convention of the American Institute of Electrical Engineers was held at the Hotel Frontenac, in the Thousand Islands, from June 28th to July 1st. Two hundred and fifty-two delegates and their friends were present at the convention, which was attended with splendid weather. The papers read, thirty-six in number, were all well discussed and brought out much interesting information. The entertainment programme embodied a bridge whist tournament for the ladies, a golf tournament for the members, and opportunity to participate in the boating and fishing for which these islands are noted.

## Opening Session, June 28th.

President L. A. Ferguson opened the convention with the annual presidential address. He confined his remarks chiefly to the subject of centralization of power supply. Mr. Lewis B. Stillwell, the president-elect, was the next speaker. He pointed out the necessity for the electrical engineer taking a prominent part in community affairs in order to secure proper national development and to prevent adverse legislation.

The first session dealt largely with experimental work. A paper prepared by Prof. A. E. Kennelly and Messrs. C. A. Wright and J. S. Van Bylevelt, of Harvard University, dealt with "The Convection of Heat from Small Copper Wires." The paper tabulated the results of two sets of experiments. Dr. C. P. Steinmetz, Mr. Chas. F. Scott and others participated in the discussion on this paper.

A very interesting paper was then read by Mr. E. F. Alexanderson on "An Alternator for 100,000 Cycles."

The next paper was by Mr. L. W. Chubb, of the Westinghouse Electric & Manufacturing Company, on "Method of Testing Transformer Core Losses, Giving Sine-wave Results on Commercial Circuits." He described in this paper an instrument known as the core loss voltmeter, which is an indicator enabling the voltage to be so adjusted that the loss in a transformer coil as increased by an ordinary wattmeter will be the same as at normal voltage on a circuit having a sine-wave voltage of normal frequency. This instrument is a combination of a small choke coil, with an iron core and a wattmeter.

## Monday Afternoon.

Mr. F. Creedy's paper dealing with the "Theory of the Adjustable Speed, Single-phase, Shunt Induction Motor" was first read. The author stated that an eight-pole, 60-cycle machine could probably be built to operate successfully up to 2,000 r.p.m. if equipped with a mechanically good commutator.

"Heating of Induction Motors," prepared by Mr. A. M. Gray, of Milwaukee, outlined specific computations to show a method of predetermining the heating in a design of induction motors.

Messrs. S. B. Charters, Jr., and W. A. Hillebrand's joint paper was next read, and dealt with "The Reduction in Capacity of Polyphase Motors Due to Unbalancing in Voltages." In the discussions of this paper many observations were reported of the equalizing action of synchronous motors in restoring the voltage balance, apparently by taking power from one phase and returning it to another.

A paper by Prof. A. S. Langsdorf on "The Current Losses of a Single-phase Induction Motor," and one by Messrs. H. G. Reist and H. Maxwell on "Multi-speed

Induction Motors" completed the first day's session.

## Tuesday Morning, June 29th.

Two papers by Percy H. Thomas, in abstract, on "Output and Regulation of Long-Distance Lines" and "Calculation of High Tension Line," were first read. Messrs. Chas. F. Scott, C. P. Steinmetz and R. D. Mershon, Prof. T. R. Rosebrugh, Toronto University, and others discussed these papers. Opinions differed as to the comparative ease of calculation with Mr. Thomas' equations and with those submitted by Professors Rosebrugh and Kennelly.

The next paper read was that of Mr. J. B. Taylor on "Even Harmonics in Alternating Current Circuits." In the discussion following, methods of cancelling even harmonics were discussed.

Prof. J. B. Whitehead then read his paper on "The Resistance and Reactance of Armored Cable."

## Tuesday Evening.

"Corona Phenomena in Air and Oil, and Their Relation to Transformer Design" was the title of the first paper read, and it created much discussion.

A paper entitled "Surges on Cable Systems with Aluminum Cell Protection," prepared jointly by Mr. S. D. Sprong and Prof. E. E. Creighton was read, and gave a large number of oscillograms and comments upon some surge experiments on the underground circuits of the United Electric Light & Power Company of New York in 1908.

In a paper on "Split-Pole Converters and Storage Battery Regulation," Mr. J. L. Woodbridge described the features of Fort Gary plant, pointing out the increased output obtained by good regulation. The final paper of the evening was read by Mr. H. W. Fisher, and touched on "Losses, Induced Volts, and Amperes in Armor and Lead Cores of Cables."

## Wednesday Morning, June 30th.

Two simultaneous sessions were held on Wednesday morning. At one section the application of electricity commercially was discussed. Papers on "The Electrical Control of Rolling Mill Motors," by Mr. C. T. Henderson; "Automatic Motor Control," by Mr. H. E. White; "Power Requirements for Rolling High-Carbon Steel of Small Section," by Mr. B. Wiley; "Function of Flywheels in Electrically-Driven Rolling Mills," by H. C. Specht, were discussed by this section. In the discussion following these papers a marked enthusiasm for the future of electricity in this field was noted, and the co-operation of the central station and the steel mill was strongly advocated. At the other section circuit measurement, dynamo and fuse designing were the topics discussed.

## Thursday, July 1st.

The final session of the convention was held Thursday morning and was chiefly given up to a discussion of educational problems. Papers were read as follows: Dr. C. P. Steinmetz, "Value of Classics in Engineering Education"; C. R. Dooley, "Training of Non-Technical Men." Dr. Steinmetz stated the need of the production of engineers who are also broad-minded, intelligent citizens.

"Pole Face Losses," by Messrs. C. A. Adams, A. O. Lanier, C. C. Pope and C. O. Schooley, was abstracted by Prof. Adams, and concluded the work of the convention.



# Winnipeg's Electrical Display at the Western Fair

## Attractive Features of the City's Exhibit—An Interesting Model of the Point du Bois Power Plant

The electrical exhibit made by the city of Winnipeg during the Industrial Fair at Winnipeg, from July 10th to 17th, proved to be the most popular and most interesting feature of the display in the Manufacturers' Building. It was designed to educate visitors and the citizens of Winnipeg in the uses to which electricity may be put. Mr. F. A. Cambridge, city electrician, designed the exhibit, and it was interesting not only for its educational value but for its attractiveness. In addition to the electrical display there was exhibited a model of the civic

brass drills, four different types of arc lamps and luminous radiators, the latter designed to supplement the coal, wood or gas grate. A new type, direct-reading meter, that enables every householder to read his own meter with ease, was also shown. A distinctive feature of the display was the operation of a washing machine and wringer from the power required to light an ordinary incandescent bulb. Systems of electric car and house heating created considerable interest.

Several domestic novelties, such as curling irons,



City of Winnipeg's Electrical Display at the Industrial Fair.

power plant at Point du Bois, 75 miles from Winnipeg. The model, about 15 by 12 feet, gave a splendid idea of the appearance of the Winnipeg river, where the power is derived. The land was shown by moss and every detail of the water and rocky ledges is set forth, as well as the power houses and dams. This model may be observed in the accompanying general view of the electrical exhibit. There is at this point a natural waterfall of 45 feet, which is fully taken advantage of, and the first unit of power delivered in Winnipeg will consist of 17,000 horse-power. Eventually there will be 65,000 horse-power developed.

The machinery and appliances were all operated by electricity. Motors of all types, single and three-phase, and one of variable speed suited to the operation of job printing presses, were in operation, as were various styles of fans and blowers, meat choppers, coffee grinders, washing machines, wringers, ice cream freezers, electrically heated soldering tools, electrically driven

cooking utensils and an "automatic kitchen," consisting of a small motor with attachments for a potato peeler, bread mixer, ice cream freezer and washing outfit, were favorably commented upon and were revelations to the average housewife. There were also electric ovens, broilers, griddle cake cookers, coffee percolators, tea kettles, frying pans, corn poppers, four styles of toasters, heaters for shaving water, cigar lighters, chafing dishes, double boilers and five o'clock tea sets. These cooking utensils were in constant use every afternoon with lady cooks demonstrating them to the public.

"Holyphane" reflectors for incandescent lamps brightened up the place at night, and the "gyrofan" kept the temperature at a comfortable point. This latter was a revolving portable fan system on a pedestal, instead of being hung from the ceiling.

Other phases of the exhibit were the electrical signs and the vacuum cleaning processes. These were demonstrated on upholstered furniture and carpets. The



whole exhibit is set off by a number of illuminated bronze statues and table lamps. The civic parks board decorated the place with beautiful plants and hanging baskets. When the exhibit was lighted at night the effect was most brilliant and a steady stream of visitors studying it.

The exterior of this exhibit was effectively decorated with an artistic lighting scheme in colors, in which the words "Light," "Heat," and "Power" were made prominent. A suggestion was also effected by the same method to "advertise by electricity."

#### Electrical Exhibits at the Fair.

The following exhibitors took part in making the civic display a notable one:—

E. B. Code, Winnipeg, showed three different makes of electric vacuum cleaners, both stationary and portable, manufactured by the Zimmer Vacuum Company, of Minneapolis. These machines, besides being vacuum, are arranged to do fumigating and disinfecting by the blower process.

The "1900" Washer Company had on exhibition one of their latest types of electric washing and wringing machines.

Mantel-Stewart Company, of Montreal, showed immense electric advertising signs.

The Ashdown Company, Winnipeg, had on view a direct-connected forge blower for blacksmiths, also electric ice cream freezers, washers, etc.

Goodyear Electric Company, Winnipeg, displayed a line of "Holophane" glass reflectors, also "Flex-Lume" signs for house or store, fans and conduit fittings.

Northern Electric & Manufacturing Company, of Montreal, had a full working central energy switchboard.

Canadian Westinghouse Company exhibited 3-phase motors, Royal coffee grinding machines, meat choppers, and several forms of luminous radiators for heating.

Canadian General Electric Company, Toronto, exhibited 4-ampere lamps, magnetite system, a full line of Simplex and general cooking and heating devices, also Mercury arc rectifier panel for charging automobiles, sewing machines electrically driven, the tungsten diffuser, and a standard line of motors.

Jas. Stewart Electric Company, Winnipeg, showed several electric household devices, and small motors.

Kimball Electric Company, of Chicago; Chicago Pneumatic Tool Company, and the Packard Tool Company all exhibited various up-to-date electrical devices. Meter Company.

Dawson & Company, Montreal, showed domestic and tailors' electric irons, car and house heaters, etc.

R. E. T. Pringle Company, Montreal, exhibited the Adams Bagnal regenerative arc lamps.

Western Electrical Company showed 3-phase motors and Wagner single-phase motors, as well as white and yellow Victor flaming arc lamps.

Great credit is due to the Chief City Electrician, Mr. F. A. Cambridge, for the very complete electrical display, and for which he designed elaborate plugging-in boxes at various points to facilitate operations.

The power plant model was designed by Smith, Kerry & Chace, and was in charge of Mr. Sutherland, of the City Power Department's staff.

Controller Cockburn was on hand to explain to those interested the great power project Winnipeg is now completing.

Mr. Moran, of the Industrial Bureau, assisted Mr. Cambridge.

The exhibit of the United Wireless Telegraph Company consisted of a large model of a steamer which was built by Robert Grant, agent for the company in Winnipeg, and which was operated by a wireless machine

which forced current from the opposite end of the booth. The machinery of the ship could be operated in just as effective a manner if it were five miles away from the transmitter.

Portage avenue, Winnipeg's great main artery, is now lit beautifully by Canadian General Electric 4-ampere lamps on the magnetite system—a brilliant white light. It is regrettable that these lamps were not placed in the centre of the street.

Directly opposite the exhibition, a sub-station of the city's electrical plant was in operation supplying the current for the arc lamps in the grounds and the power to motor users.

#### Westinghouse Company Exhibit.

The Canadian Westinghouse Company, Limited, realizing the growing demand for their apparatus in the West, have for a number of years exhibited their products at the Winnipeg Exposition.

This year they were able to secure a larger space, which permitted a more elaborate display. Besides showing a complete line of direct and alternating current



Canadian Westinghouse Exhibit at the Winnipeg Industrial Fair.

motors and other power apparatus, they exhibited several sizes of sad irons for domestic and commercial use, toasters, luminous and air radiators, motor-driven washing machines, vacuum cleaners, etc.

One of the prominent features was the complete display of fan motors. The new eight-inch fan, adaptable for either bracket or desk use, attracted a great deal of attention. The exhibit was brilliantly lighted with Nernst lamps, for which there is a growing demand in the West for the lighting of the many larger buildings now being erected. The lamp was shown in all sizes and styles.

The air brake department of this company exhibited standard compressors and other detail.

Mr. J. S. Latimer, who has charge of the Nernst department of the Winnipeg office, had charge of the exhibit.

J. H. Ashdown Company had a very nice exhibit showing all forms of electric fixtures, table lamps, also a dark room demonstrating the "Eye-Comfort system" of interior lighting.



# Members of the Canadian Electrical Association and their friends



- |                             |                                  |                                      |                                   |
|-----------------------------|----------------------------------|--------------------------------------|-----------------------------------|
| 1. C. Brandeis, Montreal.   | 10. T. S. Young, Toronto.        | 19. R. Gamble, Ottawa.               | 28. Frank Smallpiece, Montreal.   |
| 2. J. Warren, Montreal.     | 11. A. P. Doddridge, Quebec.     | 20. R. J. Smith, Perth.              | 29. W. E. Roper, Ottawa.          |
| 3. J. Mochon, Montreal.     | 12. A. A. Dion, Ottawa.          | 21. J. D. Lachapelle, Montreal.      | 30. James Johnson, Ottawa.        |
| 4. John Dorais, Levis, Que. | 13. L. J. Denis, Quebec.         | 22. C. C. Starr, Halifax.            | 31.                               |
| 5. A. Sangster, Sherbrooke. | 14.                              | 23. W. E. Reesor, Lindsay.           | 32. A. O. Hunt, London.           |
| 6. E. A. Brough, Tweed.     | 15. H. O. Fisk, Peterboro.       | 24. V. Boyd, Toronto.                | 33.                               |
| 7.                          | 16. J. F. B. Vandeleur, Toronto. | 25. F. A. Chisholm, St. John's, Que. | 34. J. T. Cassels, Quebec.        |
| 8. L. B. Webber, Toronto.   | 17. G. F. Streb, Collingwood.    | 26.                                  | 35.                               |
| 9. R. F. Pack, Toronto.     | 18. G. A. Tanguay, Quebec.       | 27. S. G. Chambers, Truro, N.S.      | 36. Charles F. Medbury, Montreal. |



# t the Quebec Convention—In front of the Champlain Statue



Photo by Montminy.

le, Merrickville.  
Wilkes, Montreal.  
sembke, Petrolea.  
Schwell, Toronto.  
edge, Toronto.  
Hamilton, St. Catharines.  
n, Quebec.  
erson, Duluth, Minn.

45.  
46. J. M. Forbes, Montreal.  
47. J. J. Wright, Toronto.  
48. T. Passingham, Montreal.  
49. Clarence Thomson, Montreal.  
50. J. E. Ryan, Montreal.  
51. R. G. Black, Toronto.  
52. G. H. Wendt, Montreal.

53. W. A. Bucke, Toronto.  
54. D. S. Barton, Levis, Que.  
55. Wm. P. Flint, Pittsburgh, Pa.  
56. M. Pellatt, Toronto.  
57. E. P. Heaton, Toronto.  
58. J. S. Allen, Montreal.  
59. A. T. Hicks, Trenton.  
60. E. A. Evans, Quebec.

61. W. H. Reynolds, Montreal.  
62. Geo. C. Rough, St. Catharines.  
63. P. H. Hover, New York.  
64. Wm. McCaffrey, Toronto.  
65. A. B. Lambe, Toronto.  
66. A. C. Towne, Toronto.  
67. A. V. Gale, Hull, Que.  
68. J. M. Deagle, Orangeville,.

# Practical Accounting for Electrical Companies

## Importance of Uniformity in Book-keeping—Classification of Income Accounts—A Typical Balance Sheet\*

BY R. F. PACK.

The subject of accounting for electrical corporations is one that is attracting a considerable amount of attention at the present time. Many of the State Governments, through their public service commissions, have issued orders calling for uniform systems of accounting, and these systems require a very detailed classification of accounts. Moreover the companies themselves are feeling, instinctively, a growing need for a greater knowledge only to be obtained by a careful and scientific arrangement of income and operating accounts. It is, of course, evident that the public service commissions require this detailed classification in order to obtain comprehensive reports of the affairs of the companies for the benefit of the public, whose servants they are; but it may be said that this "interference" by the State has benefitted the companies as much as, or perhaps more than, it has served the State.

Up to the present we, in Canada, have not been compelled to make drastic changes in our systems by any process of law, but directors and officers, in charge of our companies, are realizing more and more the advantages to be gained by a more elaborate classification, and should the time arrive when our Provincial Legislatures require reports similar to those prescribed by the State Governments in the United States, and by the Board of Trade in Great Britain, it would be much to our advantage if we had already decided on a uniform system, and could thus present a united front in meeting any committee, appointed by the Provincial Government, to discuss and to formulate a definite system.

Furthermore, we stand very much in the position of manufacturers, and no manufacturer to-day can hope to reap a full measure of financial success unless he has an accurate knowledge of the exact cost of both manufacturing, and distributing, his commodity. The day is long past when we can charge for our commodity—electric current—"the highest price that the traffic will bear." We have to meet on all sides the keenest competition, and it is now necessary for us to be prepared to supply electric current at the lowest possible price, consistent with financial safety, and this cannot be done unless we have an absolute knowledge of the exact cost of production and distribution.

At the meeting of the National Electric Light Association, held in Chicago in May, 1908, the committee appointed to consider "A Uniform System of Accounting," presented its report. This committee had drawn up a classification of accounts which they wished to have adopted by the National Electric Light Association, in order to strengthen the hands of the electric light companies in presenting their views to the Public Service Commission of New York State, and as the system adopted by this Commission (to take effect on January 1st last) so closely approximates the system proposed by the National Electric Light Association, it is evident that the companies concerned were able to convince the Commission that their classification would give the State all the information it required, and, at the same time, meet the needs of the companies.

The Railroad Commission of the State of Wisconsin has also prescribed a uniform classification of accounts for electric companies, and this system is very similar to that adopted by the State of New York. Other States, through their public service commissions, have the matter under consideration, and there is little doubt that this system of accounting, having already so wide an application, will extend its field, and that, sooner or later, all companies will be influenced by it.

It must, of course, be understood that it is impossible for all companies, whether large or small, to have an exact uniformity of accounting to the minutest detail, and the aim and object should be to secure uniformity in essentials, in other words to agree on the basic principles; and then, as local conditions require or permit, to build a superstructure to satisfy the most exacting demands. Assuming that the average income of electrical companies to be three dollars per inhabitant, of the territory served, it was estimated that 75 per cent. of the companies doing business in the United States, earn, on the average, less than \$15,000 per annum; similar conditions, no doubt, obtain in Canada, which make it impossible for the smaller companies to carry out a very elaborate system, and the aim of this paper is to suggest those main accounts which can be

kept, and which most certainly should be kept, and then to show how each company can provide sub-accounts to satisfy its own requirements.

The form which follows is the foundation upon which every system should be built:

### BALANCE SHEET.

#### Assets—

Property and Plant: Franchises and Patent Rights. Land. Buildings and Fixtures. Power Plant Equipment. Transmission and Transformation System. Storage Battery Equipment. Distribution System. Utilization Equipment. General Office and Stores Equipment. Miscellaneous.

Treasury Securities: Stocks and Bonds.

Investments: Stocks and Bonds of other Companies. Other Investments.

Reserve, Sinking and Special Fund Assets:

Current Assets: Cash. Materials and Supplies. Bills Receivable. Accounts Receivable. Interest and Dividends Receivable. Other current assets.

Prepaid Accounts: Taxes Prepaid. Insurance Prepaid. Rents Prepaid. Other Prepayments.

Open Accounts: Deficit.

#### Liabilities—

Capital: Capital Stock, Preferred. Capital Stock, Common. Funded Debt.

Mortgages: Real Estate Mortgages. Other Mortgages.

Current Liabilities: Notes and Bills Payable. Accounts Payable. Consumers' Deposits. Sundry Current Liabilities.

Accrued Liabilities: Insurance Accrued. Taxes Accrued. Interest on Funded Debt Accrued. Sundry Liabilities Accrued.

Open Accounts:

Reserves: Amortization Reserve. Special and General Reserves.

Surplus:

### INCOME ACCOUNT.

#### Operating revenues:—

Commercial Lighting Earnings .....	.....
Commercial Power Earnings .....	.....
Municipal Street Lighting Earnings.....	.....
Municipal Building Lighting Earnings.....	.....
Miscellaneous Earnings from Operation.....	.....

Total Operating Revenues .....

#### Operating Expenses:—

Generation Expense .....	.....
Transmission and Transformation Expenses..	.....
Storage Expense .....	.....
Distribution Expense .....	.....
Utilization Expense .....	.....
Commercial Expense .....	.....
New Business Expense .....	.....
General Expense .....	.....
Undistributed Charges .....	.....

Total Operating Expenses .....

Net Operating Revenue .....

#### Non-Operating Revenues:—

Profit on Wiring and Sales .....	.....
Rents .....	.....
Interest Receivable .....	.....

Total Non-Operating Revenues .....

Gross Income .....

#### Deductions:—

Interest on Funded Debt.....	.....
Interest on Mortgages .....	.....
Interest on Floating Debt.....	.....
Miscellaneous Deductions .....	.....

Total Deductions .....

Net Income .....

Sundry Appropriations .....

\*Paper read before the Canadian Electrical Association, Quebec Convention.



Stock Dividends .....

.....

Surplus .....

As a guide to the Main Expense Account, it may be said that:—

Generation includes—Cost of electric current delivered to station terminal board.

Transmission and Transformation includes—Cost of conducting current to sub-stations and cost of transforming and making ready for delivery to distribution system.

Storage includes—Cost of storage battery.

Distribution includes—Cost of conducting current from sub-station terminal boards to customers' premises.

Utilization includes—The trimming and inspection of lamps, customers' premises expenses, lamp renewals and the like.

Commercial Expenses includes—Cost of reading meters and all office expenses in connection with consumers' accounts.

New Business Expense includes—Cost of securing new business.

General Expense includes—Administration and miscellaneous general expenses.

We have here the skeleton, only, of a good system of accounting, and there are but few companies that will not require a more detailed classification; it must be borne in mind, however, that the details, no matter how numerous, must be treated as sub-accounts of the main accounts, and in no case should the general plan be materially altered.

The Property and Plant accounts may be further divided as follows:—

#### Land—

Occupied by generation stations. Occupied by outside sub-stations. Used for other purposes.

#### Buildings—

Steam power plant buildings. Hydraulic power plant buildings. Sub-station buildings and transformer stations. Buildings used for general corporate purposes.

#### Power Plant Equipment—

Furnaces, boilers and accessories.

Steam Plant—Furnaces, boilers and accessories. Steam engines. Gas Plant—Gas producers and accessories. Gas engines. Hydraulic Plant—Dams, canals and pipe lines. Turbines and water wheels. Miscellaneous power plant equipment. Electric generators. Accessory electric power equipment.

#### Transmission and Transformation System—

Transmission overhead system. Transmission underground system. Sub-station and transformer station equipment.

#### Storage Battery Equipment—

#### Distribution System—

Overhead distribution system. Underground distribution system. Line transformers and devices. Services. Meters. Municipal street lighting system.

#### Utilization Equipment—

Commercial lamps and equipment. Municipal lamps and equipment. General utility equipment.

#### General Offices and Stores Equipment—

#### Miscellaneous—

Electrical tools and implements. Electrical laboratory equipment. Stable equipment. Miscellaneous charges during construction.

The Revenue Accounts cannot be arbitrarily classified. A broad generalization has been suggested, and local conditions must govern a further classification.

The Expense Accounts should be kept in fuller detail and the following sub-accounts will serve the purposes of the majority of the companies:—

#### Generation Expense—

##### Operation:

Superintendence.

Boiler labor.

Engine labor.

Electrical labor.

Miscellaneous labor.

Fuel.

Water.

Lubricants.

Miscellaneous supplies and expenses.

##### Maintenance and Repairs:

Boiler equipment.

Steam equipment.

Electric generators.

Accessory electric equipment.

Buildings and fixtures.

Miscellaneous station equipment.

Steam power generation.

Corresponding, or appropriate accounts. } Gas power generation or Hydraulic power generation.  
Electric current purchased. }

#### Transmission and Transformation Expense—

Operation—Inspecting and patrolling transmission system. Sub-station labor. Sub-station supplies and expenses. Maintenance and Repairs—Transmission line. Sub-station buildings. Sub-station equipment.

#### Storage Expense—

Operation—Labor. Supplies. Maintenance and Repairs—Batteries. Accessories.

#### Distribution Expense—

Operation—Superintendence. Distribution office expenses. Setting and removing meters and transformers. Connecting and disconnecting services. Meter testing and inspecting. Meter department supplies and expenses. Miscellaneous labor and expenses.

Maintenance and Repairs—Overhead system. Underground system. Services. Line transformers. Meters.

#### Utilization Expense—

Operation—Trimming and inspecting lamps. Lamp supplies. Incandescent lamp renewals. Miscellaneous supplies and expenses. Consumers' premises expenses.

Maintenance and Repairs—Lamps. Consumers' installations. (Sub-accounts should be kept separating commercial and municipal expenses.)

#### Commercial Expense—

Reading meters—salaries and expenses. Collection department—salaries and expenses. Customers' department, accounting, salaries and expenses. Miscellaneous supplies and expenses.

#### New Business Expense—

Salaries. Canvassing and soliciting. Advertising. Demonstrations. Supplies and expenses.

#### General Expense—

Salaries and expenses of general officers. Salaries and expenses of general office clerks. General office—supplies and expenses. General law expenses. Miscellaneous general expenses. Maintenance and repairs of general office buildings and fixtures. Maintenance and repairs of general office equipment.

#### Undistributed charges—

Insurance. Injuries and damages. Store expenses. Stable expenses. Taxes. Uncollectable bills. General amortization.

The remaining accounts, having to do with deductions from income, such as Interest on Funded Debt, and miscellaneous appropriations to Reserve Accounts, etc., are self explanatory and can be classified to suit varying conditions.

It is manifestly impossible to satisfy every requirement of every electrical company; the aim has been to give, as briefly as possible, a general outline of the main features of a system of accounting that could be made, more or less, uniform in Canada, and the companies themselves must remedy deficiencies, and supply additions, to suit their own requirements, as it will be readily understood that a very lengthy paper would have to be written to set forth a system comprehensive enough to suit all conditions.

In regard to depreciation, or amortization, of property and plant; it is advisable that a certain amount be charged, month by month, to operating expenses through a general amortization account, the amount so charged to be credited to an amortization reserve account, and to be sufficiently large enough to cover the ordinary wear and tear, and obsolescence, that have taken place during the month, in the property and plant of the company (less the amounts charged to the various repair accounts in the operating expenses), and to provide a reserve, estimated to be sufficient, to cover the cost of property destroyed by extraordinary casualties. At the end of the fiscal year a proper amount should be written off the various property and plant accounts to cover ordinary depreciation and extraordinary casualties, the total of the amounts thus written off being charged to the amortization reserve account.

Great care should be taken to identify all additions made to the property and plant accounts, and it should be possible at the end of each month to state, with much particularity, the exact nature and extent of the additions, or betterments, made to the plant, and to point to the exact cost of such addition, or betterment, in the appropriate Property and Plant account. For this purpose the "Work Order" system is strongly recommended; by means of this system an order, having a serial number, is given for each item of work required to improve, or to add to, the property of the company, and all material and labor used for this work is charged to this particular work order, and the



total amount so charged on the completed work order can be entered in the appropriate Property and Plant account, with a description of the work done, thus giving a ready means of identification.

It is obvious that the accounting records, by themselves, have only a limited value, and they must be studied in conjunction with the data supplied by the engineering department in order that their greatest usefulness may be realized. To mention this phase of the subject is probably sufficient, and common sense will suggest the many ways in which the engineering

records may be analyzed, and used, with the figures provided by a scientific system of accounting.

There is little doubt that the electrical companies of the Dominion will be compelled in the near future, by force of circumstances, to adopt a classification of accounts affording the maximum of analysis, requiring work of a very high character on the part of the accountants.

In conclusion, may I suggest that this Association place itself on record as being in favor of the adoption of a uniform system of accounting by the electrical companies of Canada.

## Methods of Business Getting in Central Stations

BY W. H. WISSING.

When the company with which the writer is connected became convinced that electrical devices were not experimental, but were practical and economical in operation, in addition to possessing advantages over other apparatus designed to do work of similar character using coal or gas, it determined to get them on its lines at once, but by methods, the fundamentals of which should never conflict with the sound business principles governing the introduction and sale of other necessities, to the public by commercial houses.

Conceding the value of these devices as factors tending to increase the day load at hours when the central station can best afford to furnish it, and fully realizing the importance of selling as many of them as possible, in the shortest space of time, to improve the income from residential sources, a campaign was planned upon lines which, in the company's judgment, would result not only in getting them out quickly, but with a margin of profit from their sale that would enable it to make them stick and be conducive to the sale of more of them.

The popular or common method of loaning irons was immediately put into effect, with modifications or amplifications, of the general plan employed in other cities. The irons were loaned for 30 days, with the stipulation that if, at the termination of the trial, the customer was entirely satisfied with their performance, they would retain them, paying \$6 for irons up to 6-lb. in weight, without deviation from this figure to any customer under any pretext.

This price was maintained (it still holds) while some of the department stores were selling some other iron at \$3.98 or less, but with no specific guarantee. The latter were not equipped to repair or maintain electrical devices; when they went wrong and out of commission, purchasers needing repairs to their irons were referred to their local electrician, and must needs wait until the damaged part could be gotten from the manufacturer, and then pay (even if a very small margin of profit be added) a price for the repairs usually more than enough to wipe out the difference between the original purchase price and our \$6 charge.

The Union Electric Light & Power Company, of St. Louis, to which the writer refers, determined to see to it that these desirable and convenient devices should win recognition on their merits. It determined, also, that there should enter into their introduction to the public not the slightest element of chance or speculation on the part of the purchaser. It prepared at once to assume all responsibility, to get squarely behind them, and to permit no quibbling in exchanging defective or ineffective apparatus for new or other devices better suited to the customers' needs.

In this lies the warrant and justification for asking prices that, while neither exorbitant or prohibitive, hold a sufficient margin of profit to enable the company to make guarantees that would at once establish and maintain an ever-increasing degree of confidence in them not possible otherwise without loss.

In connection with the iron, the guarantee is practically perpetual. It reads thus: "Hereafter your company is to renew, without charge to me, such parts of the 3 and 6-lb. irons (excepting the iron bodies) as may prove defective, if the iron has been used exclusively on your electric service." The company lives up to the letter and the spirit of this guarantee, even in the face of evident discord at home, in which the iron sometimes appears to have played a leading part.

This very broad guarantee covers in its printed matter the 3 and 6-lb. irons only, but its spirit and import applies to the entire line of devices; the disposition always is to take the customer's view of his troubles and help him out in the same degree that he feels justified in paying the lighting company a trifle more for an article that he is assured by its guarantee will not, if it meets with a mishap, cost him for repairs

something approaching the price he would be compelled to pay for one not thus protected.

To obtain the best possible results from this arrangement, the company is careful that apparatus is not sold for any purpose for which it is not well designed. It is especially insistent that the prospective customer shall know what it will cost him to operate the device he may purchase, giving him the limit always. It has frequently declined to loan articles for trial where it knew that the first month's bills would bring back with it the device with its reputation irretrievably blasted in the estimation of its user.

The luminous radiator is an excellent instance of what it is best not to sell except for the purpose it was designed to serve, yet the company has sold several hundred of them. It begins with the warning that the 750-watt radiator will cost (at residential rates, 12 cts.) 9 cents an hour to operate, and the 1,500-watt 18 cents an hour; that to attempt to use it for general heating is at present absurd, but that for temporary use in the morning while dressing, for additional heat in the bathroom or nursery, it is ideal and not expensive. The customer thus prepared does not come back with complaints about excessive operating costs. He uses them for the purpose intended, likes them, and commends them to others.

The reference to the department store was in no sense intended as in disparagement of them. As mediums for the quick introduction of any new thing they are unequalled. They are in daily contact with thousands who are there to purchase, while those who come to the company usually come to pay. The mental attitude is, therefore, different and much in their favor; but the company holds, in connection with electrical devices, that until they have become standardized, with repair parts as easily obtainable and replaced as other household apparatus, that they should be handled exclusively by central stations or dealers as agents, backed by the manufacturers, who will make it their special business to guard the purchaser against acquiring apparatus not suited to his requirements, and that when they do sell, the apparatus shall represent thereafter the absolute maximum of convenience with a minimum of trouble and expense. You cannot maintain this position at \$3.98 per.

A year or so ago, a young man of modest appearance and address came to our show room and, somewhat diffidently inquiring the price of a coffee percolator, said that as soon as he could afford it he would purchase one. It developed that he had a chafing dish and a 6-inch disk stove, and that his wife, who was his cook as well, found them so convenient and inexpensive to use that they were saving up for the next addition—the percolator. He was asked if he cared to purchase one at once, and pay for it in several instalments. He did. The company immediately got busy with the instalment plan, evolving the schedule on the preceding page, which is recommended highly, with the rest, as an additional inducement to customers to add gradually to their stock of electric devices.

In its experience, in developing this class of business it has found the best market among those who do some or all of their own work. Nearly 75 washing machines at \$55 each, paid for "on time," are in use on its lines, saving their original cost and \$20 to spare every year, counting the cost of a wash woman at \$1.50 per week "and found" as saved by the use of them.

A word as to the method of keeping track of repairs, renewals, exchanges, etc., in this connection. It is simple, easy and effective, especially in cases where devices come back too often, and works as a check on the careless. A set of blank forms is kept as follows:—


When a trial is desired by a customer, Form No. 1 must be signed and sent in. Form No. 2 is the receipt for the article and is attached to Form No. 1, completing the transaction until trial is finished. Form No. 3, "Confirming Order," is



signed, and with Form No. 2 is attached to Form No. 1 and charged up, all being placed in an envelope with customer's name and address.

If madame's iron or curling tongs get out of order, she does not hesitate to apprise the company of the fact, which sends for it, using Form No. 4, which is an order on her to deliver it. When it is repaired, it goes back to her on Form No. 2, her second receipt showing what was done to it and marked "no charge." If this is repeated too often, the company reminds her courteously that on the different dates shown by her receipts it made repairs, the nature of which indicated harsh usage, and that while it would continue to keep it going, there are limits beyond which good irons and tongs are not useful, etc.

It contends, in conclusion, that the ideal way to introduce electrical devices is to charge for them a price that will enable one to maintain them; that in doing this, each of them is made a valuable selling agent for others; that the cost of this method represents a goodly profit left after all repairs, ex-



## LEGAL DEPARTMENT

Information for this Department is solicited from readers of the "ELECTRICAL NEWS." Send in the particulars of recent cases in which you were interested, giving the main facts tersely

**Driscoll Award Sustained.**—The Court of Appeal dismissed the appeal of the Ottawa Electric Railway Company from the judgment of Mr. Justice Anglin awarding Miss Ellen Driscoll \$4,000 and her father, Joseph Patrick Driscoll, \$500.

**City Loses Appeal.**—In the case of the city of Winnipeg v. the Winnipeg Electric Railway Company, the city sought to have it declared that the Street Railway Company is not entitled under the agreement between the city and the company to bring electrical power into the city which had been generated outside the city limits without first obtaining the consent of the city to this being done. It referred to power generated at Lac du Bonnett. The court dismissed the appeal.

**Morin v. Ottawa Electric.**—This was an appeal by defendants before the Ontario Court of Appeal from judgment of Chief Justice Meredith upon the findings of a jury, in favor of plaintiff, Lena Morin, for the recovery of \$5,500 damages in an action for personal injuries. There was also judgment in favor of plaintiff, Oliver Morin, for \$233, but this was not appealed against. The defendants claimed the amount excessive and asked for a new trial. They also complained of misdirection, but this ground was not strongly urged. The court held that while the damages awarded seemed liberal they were the jury's estimate after the trial judge had fully laid before them all the elements of damage which they should consider and take into account, and had cautioned them against giving to the plaintiff such a sum as would really amount to a punitive award rather than a fair compensation, and warned them of the impropriety of giving an amount that would secure her an annuity equal to or nearly approaching what she could have earned if she had not been injured, and finally told them that they were not to give her anything on account of sympathy, "and do not especially give her anything because you think this railway company ought not to have allowed the accident to happen." There was no reason to suppose that the jury misunderstood him in any respect. There was nothing in the circumstances to fairly give rise to the inference that the jury had taken into account matters which they should not have considered, and therefore their award should not be interfered with.

### A FREE TRIAL AT YOUR HOME.

Any of the articles listed below will be delivered to you by wagon, for trial, during the period indicated opposite each item, without charge for delivery, trial or return.

ARTICLE	Size, Style, Weight	Catalogue No.	Selling Price	Terms of Payment After Trial and Acceptance			At Your Disposal For
				Cash with Confirming Order	With First Monthly Bill for Current	Monthly Thereafter Until Paid	
Smoothering Iron...	Nickel... 3 lbs.	38,124	\$5.00		\$2.00	\$1.50	30 Days
" " " "	Aluminum... 6 "	36,815	6.00		2.00	2.00	30 "
" " " "	Gun Metal... 6 "	75,120	6.25		2.25	2.00	30 "
" " " "	Nickel... 6 "	75,115	6.25		2.25	2.00	15 "
" " " "	Aluminum... 8 "	75,126	7.00		3.00	2.00	15 "
" " " "	Gun Metal... 8 "	75,135	7.25		3.25	2.00	15 "
" " " "	Nickel... 8 "	75,130	7.25		3.25	2.00	15 "
Tailors' Iron...	" " " "	45,321	12.00		4.00	4.00	10 "
" " " "	" " " "	47,357	12.75		4.75	4.00	10 "
" " " "	" " " "	47,362	14.00		6.00	4.00	10 "
" " " "	" " " "	47,367	15.00		6.50	4.25	10 "
*Curling Iron Heater	Nickel... 1,274	3.00		1.50	1.50	10 "	
* " " " "	Polished Brass... 1,275	3.25		2.00	1.25	10 "	
Shaving Mugs...	" " " "	44,303	3.00	2.00	1.00	10 "	
Corn Poppers...	" " " "	45,028	5.75	2.75	1.50	10 "	
Toasters...	" " " "	1,710	5.00	3.00	2.00	5 "	
Disc Stoves...	6-inch " "	38,651	6.00	2.00	2.00	5 "	
" " " "	" " " "	38,652	11.25	4.25	3.50	5 "	
" " " "	" " " "	38,653	14.50	5.50	4.50	5 "	
Traveler's Stove...	One-half Pint " "	1,710	5.00	2.50	2.50	5 "	
Cigar Lighter...	Table " "	75,234	2.75	2.75		5 "	
Pendant...	" " " "	39,523	2.75	2.75		5 "	
Foot Warmers...	9" x 10" " "	1,371	5.00	2.50	2.50	5 "	
" " " "	9" x 12" " "	1,375	7.50	3.75	3.75	5 "	
Hair Dryers...	" " " "		35.00	11.00	11.00	5 "	
Vibrators...	" " " "		35.00	11.00	11.00	5 "	
French Hat Irons...	" " " "	1,527	6.00	2.00	2.00	5 "	
Washing Machine...	1900 " "		\$55.00	25.00	15.00	15.00	5 "
" " " "	Steiner's " "	No. 2	60.00	30.00	15.00	15.00	5 "
Mission Portables...	" " " "	223	3.00	1.50	1.50	5 Days	
Sunlight Portables...	" " " "	6554	4.00	2.00	2.00	5 "	
Extension Portables...	" " " "	21*	3.75	2.00	1.75	5 "	
Turn Down Lamp...	4' Cords " "		1.25	1.25		5 "	
" " " "	6' " "		1.50	1.50		5 "	
" " " "	8' " "		1.65	1.65		5 "	
" " " "	10' " "		1.75	1.75		5 "	
Water Bag Heater...	Standard " "		2.00	2.00		5 Days	
Luminous Radiator...	Portable Oxidized " "	42,177	18.50	8.50	5.00	5 Days	
Tubular Air Heaters...	Floor Type " "	75,210	14.50	5.50	4.50	5 "	
" " " "	Wall " "	75,205	15.50	6.50	4.50	5 "	

### Heating Appliances with their Corresponding Prices.

changes, etc., have been deducted; that selling electrical devices is not an advertising stunt, but a cold, legitimate business proposition, based upon commercial common sense that will make "both ends meet" and overlap; that giving away good, honest, serviceable and popular necessities is a crime with no excuse to support it; and as proof that these deductions are correct and that it is indulging in no fantastic dream, the company has a record of nearly 4,000 families using these devices with entire satisfaction and no complaint either as to the price they paid for them or the manner in which they are cared for.

Business conducted upon business principles will win out always. If this paper will serve the purpose of checking the reckless sacrifice of articles that have merit and value far beyond those operated in the old way, it will be worth while.

### At Toronto Exhibition

Attention is called to the advertisement of Ferranti meters in this issue. Mr. Royce informs us that an exhibit will be made in Machinery Hall, where demonstrations of the working of the meter under all loads will be made. The various claims made for this meter will be practically tested for the benefit of Exhibition visitors.

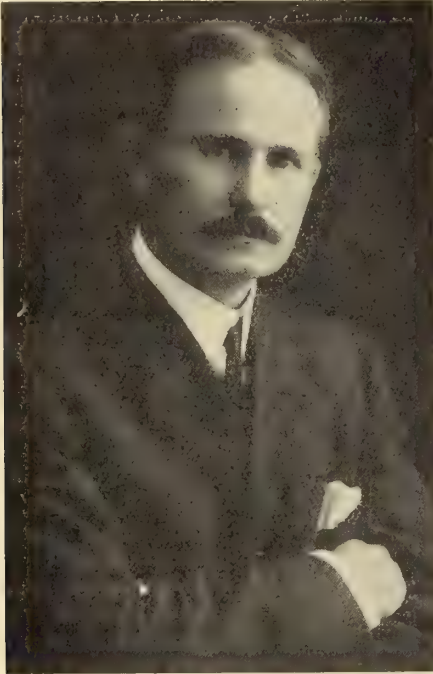
### Producer Gas Plant Installation

The Colonial Engineering Company have secured a contract from C. S. Hyman & Company, of London, Ont., for the installation of 275 h.p. Hornsby-Stockport gas engines, for their large tannery in London, and have guaranteed to produce the power, including fixed charges, for \$18.80 per year per h.p. This is \$4.70 per annum per h.p. less than the city of London will have to pay the Hydro-Electric Power Commission. It is claimed that the city of London will not be able to sell the Hydro-Electric power for less than \$50 per h.p. per year.



## Personal Mention

The announcement has just been made of Mr. J. J. Ashworth's appointment to the responsible position of assistant general manager of the Canadian General Electric Company, of Toronto. A brief sketch of Mr. Ashworth's career, gleaned from his confreres, will be interesting to our readers.



**Mr. J. J. Ashworth, just appointed Assistant General Manager of the Canadian General Electric Co.**

Mr. J. J. Ashworth was born near Newmarket, Ont., and after graduating from Newmarket High School, he came to Toronto to study architecture and engineering. Concluding his studies along these lines about 1889, he joined the engineering staff of the Edison General Electric Company, on the amalgamation, shortly after, of this company with the Thompson-Houston Company, he was associated with the Canadian General Electric Company, who assumed all the Canadian interests of the new joint company. Mr. Ashworth's duties were enlarged at this time, and he undertook the design and construction of several railway and lighting power houses as well as the superintendence of track construction. Later on he held an important position with the selling department of the Canadian General Electric Company, leaving the company in 1899 to assume the management of the General Engineering Company. After a year spent in that capacity he accepted the position of sales manager to the Canada Foundry Company, from which position his present appointment was made. Mr. Ashworth's success has not been attained without years of hard work and efficient service, and his new appointment is exceedingly popular with the staff. Those who know him best, feel that promotion is only due to merit and to his sterling business and personal character.

Mr. P. W. Sothman, chief engineer of the Ontario Hydro-Electric Power Commission, has returned from his business trip to Europe. He will place his report before the Commission in the course of a few weeks.

Mr. Roderick J. Parke, consulting engineer, Toronto, has returned from a three months' trip to Europe.

Mr. James Stott, of Vancouver, has been appointed Government Inspector of Gas and Electricity for Vancouver district.

Mr. J. A. Shand, of Messrs. Allis-Chalmers-Bullock, Limited, Toronto, has been transferred to the Vancouver offices of this company.

Mr. A. L. Woolf, of the Canadian Tungsten Lamp Company, Hamilton, Ont., has recently returned from the West, and reports an increasing demand for both tungsten and carbon lamps. He is about to leave for the eastern provinces.

Mr. Albert H. E. Wilkes, formerly assistant storage battery engineer with the Chloride Electrical Storage Company, of Manchester and London, England, has joined the Canadian General Electric Company, Toronto, where he will take charge of their storage battery department.

Messrs. Moore & Scollan, power engineers, have opened an office at 43 King street west, Toronto. The firm is composed of Mr. Harry A. Moore and Mr. John J. Scollan, who have had a considerable experience in the manufacture, installation and operation of steam, electric and hydraulic machinery, and have recently been associated with the Canada Foundry Company.

Mr. A. K. McCarthy, whose recent appointment as general manager of the Levis County Railway Company, of Levis, Que., followed the resignation of Mr. H. H. Morse, is a graduate of McGill University, leaving that institution with the class of 1906. On graduation Mr. McCarthy accepted a position with the statistical department of Messrs. Stone & Webster, public service journalists, of Boston, but later on in the same year was



**Mr. A. K. McCarthy, New Manager of the Levis County Railway,**

transferred to Sydney, N.S. Here he was appointed superintendent of the railway department of the Cape Breton Electric Company, and was in the service of this company when he accepted his present position with the Levis County Railway.



The announcement of the election of Mr. Lawford Grant as president and managing director of the recently incorporated Canadian British Insulated Company is a merited compliment to that gentleman's business ability. Before coming to Canada, Mr. Grant was in charge of several large and important construction works, notably the electrification of the naval dockyards at Malta. For the past two years Mr. Grant has represented the British



**Lawford Grant, President and General Manager  
Canadian British Insulated Co.**

Insulated & Helsby Cables Company, of England, in Canada and has during his stay made many warm personal friends, both in business and social circles. Another director of the Canadian British Insulated Company is Mr. J. J. Creelman, a well known Montreal business man and a member of the legal firm of Casgrain, Mitchell, McDougall & Creelman. Other directors are: Mr. Dane Sinclair, general manager of the British Insulated & Helsby Cables Company; Messrs. J. Taylor, A. Booker, B. Wellbourne and J. Brown, secretary-treasurer. Besides the British Insulated & Helsby Cables Company, the new company will represent the St. Helen's Cable & Rubber Company and later on several other English companies.

Mr. R. T. MacKeen, until recently factory manager for the R. E. T. Pringle Company, of Montreal, has been appointed sales manager for the eastern electrical department of the Canadian Fairbanks Company, with headquarters at Montreal. Mr. MacKeen is well known in Toronto and the eastern provinces. He was, also, for several years, identified with the Canadian General Electric Company, and the news of his new appointment will be very popular.

Mr. J. E. Aldred, of Montreal, president of the Shawinigan Falls Power Company, has been appointed receiver for the McCall Ferry Company, Lancaster, Penn. The McCall Company had undertaken the erection of a large concrete dam, sixty feet high and half a mile in length, over the Susquehanna river, near Columbia, Pa., for the purpose of generating and transmitting electricity. This dam, on which already \$10,000,000 has been spent, would have been the largest in the United States, with the exception of the one at Niagara Falls.

Mr. Alex Reid, city electrician for Prince Albert for the past four years, has resigned from that position and will enter business for himself at Kenora.

Mr. C. H. Cahan, K.C., of Montreal, has been appointed president of the Western Canada Power Company.

We congratulate Mr. Geo. C. Lembke, the genial manager of the Petrolia Electric Light & Power Company, who was married on June 29th to Miss Mae Beasley, of Petrolia. Mr. and Mrs. Lembke spent their honeymoon in Toronto.

Mr. H. G. Nicholls, who has for several years been assistant general manager of the Canadian General Electric Company and the Canada Foundry Company, has resigned that position in order to go into business for himself. He has organized a company called "Factory Products, Limited," with offices in the Confederation Life Building, Toronto, for the purpose of acting as Canadian selling agents for representative manufacturers.

The announcement is made of the formation of a partnership between Mr. J. F. B. Vandeleur, Mem. Can. Min. Inst., Mem. Chem. & Met. Soc. of South Africa, etc., and Mr. R. H. M. Nichols, Assoc. A.I.E.E., under the firm name of Vandeleur & Nichols. Mr. Nichols has been sales manager for Mr. Vandeleur for the past year and during that period the business has extended rapidly, necessitating Mr. Vandeleur's presence in Europe to complete shipments of machinery, etc. In



**Mr. John C. Creelman, Montreal, elected to the  
directorate of the Canadian British Insulated Co.**

his absence Mr. Nicholls will be in charge of the office.

Mr. Nicholls is well known to the electrical fraternity, having been connected with the electrical trade in Toronto since 1900. He was formerly with the United Electric Company, and latterly with the Gas & Electric Power Company.

Mr. Vandeleur and Mr. Nicholls will carry with them the best wishes of their numerous friends for success in their new partnership.



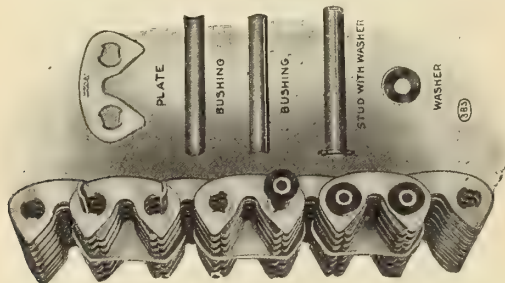
# Power Transmission under Modern Conditions

## Investigation of the Advantages obtained from the use of Chains in Line and Countershaft Driving

The study of the economics of power distribution in factory operation leads to an investigation of the comparatively little-known chain drive. Formerly, belt and gear driving were the only methods considered in line and countershaft drive, and it is only recently that the many advantages, and wide application possible with the chain drive, has brought it to the serious notice of engineers.

Chain drives were first manufactured at Manchester, England, in 1879, by Hans Renold, and it is to the Canadian agent of this pioneer firm, Messrs. Jones & Glassco, of Montreal, that the writer is indebted for much valuable information.

The first types of chain drive were very crude and undeveloped, and consequently not giving the results that were anticipated, fell into disfavor. The modern chain of to-day will have to combat the prejudice formed at that time. Three faults may still be charged against the general use of the chain drive as it is to-day. An examination of the first cost of belt and chain drives reveals the fact that the latter is approximately fifty per cent. more expensive to install. This, of course, does not take into consideration the longer life of the chain as compared with the belt. Objection may also be taken to



Showing Patent Bearings of the Silent Chain and giving General Construction.

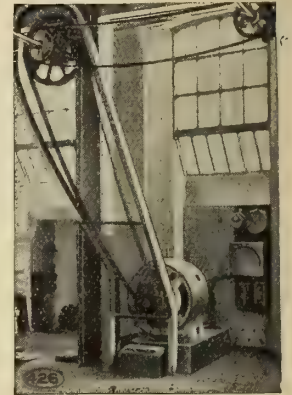
the use of the chain in vertical drives, since there must be a method provided for adjusting centres to take up the stretch. Under ordinary circumstances where chain drives are placed in a get-at-able position there would be a larger risk involved to workmen, since it is easier to become entangled in the teeth provided with the chain drive than in the ordinary belt, but the danger is obviated by the use of a guard similar to the bicycle chain guard.

The chain, however, possesses many distinct advantages that to the power user more than offset the points just mentioned. The drive may be said to be positive, giving a constantly high efficiency. It may be readily seen that no tension is required to make the chain grip the socket, and this, together with the total absence of slipping and minimum journal friction, allows a very economical use of power. Chain drives are applicable in cramped or awkward positions, occupying very little space, and give an efficient service at centre distances too short for belts and too long for gearing. A fixed speed ratio is possible where chain drives are employed, and the production of machine tools can therefore be depended upon. For ordinary slow speed work gears are unquestionably the better drive, for while both chain and gear are satisfactory, the item of expense bars the chain from

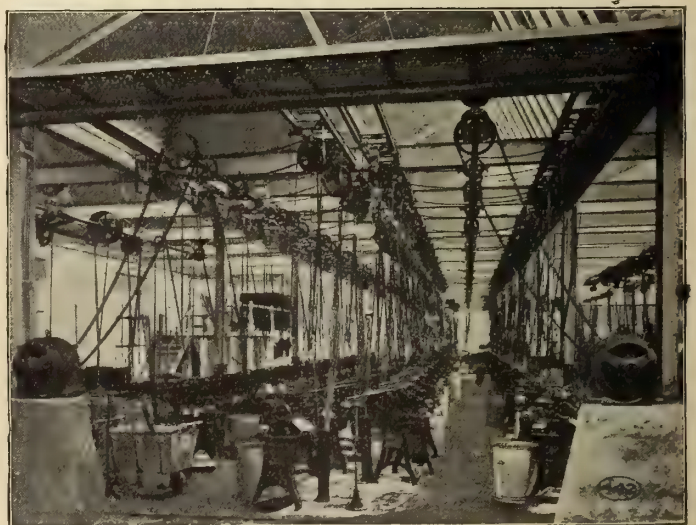
this field. In high speed work, however, gears are not satisfactory. They are always made of cast metal, and consequently are brittle, and, running at a high speed, easily break the teeth. Unless a rawhide pinion is used they are noisy, but with this extra equipment they are not a durable drive. Gears possess no elasticity; on the other hand, chains are made of mild steel stampings, and will bend and be twisted out of shape but will not break off. Chains are also silent at high speed and the elasticity prevents breakage of the machine by sudden jars.

There are three types of driving chains, and of these the patent silent chain is the form in general use; the roller chain and the solid steel block are used for special cases. The silent chain is a distinct departure from what one would expect to find in a chain. It is like a flexible internal gear, and an idea of its construction may be obtained from the illustrations. Segmental bushes are fixed in the holes of each row of links and bear on hardened pins, the hole in the alternate links being recessed to clear them. This allows a continuous film of oil to circulate between the bearing surfaces, which are doubled by the device. A spring drive is employed where the driving power is jerky or where the load is liable to sudden fluctuations. To obtain this, one of the sprockets is made in two parts; the first, or inner plate, is keyed to the shaft, and the second, or toothed rim, receives the torque through the springs.

The silent chains can be run up to 1,250 feet per minute, and even faster if special oiling devices are used. They are made in eight pitches, from one-half inch to two-inch and up to ten inches in width. As much as 500 horse-power can be transmitted by this type, and larger sizes are being developed.

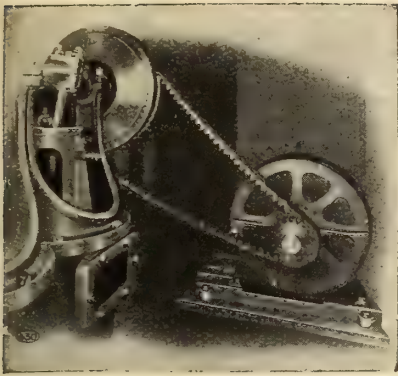


Showing Chain Guarded.

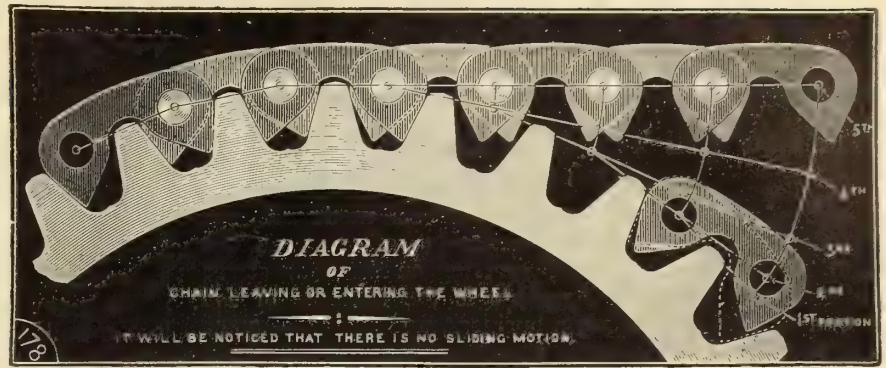


General use of Chain in Line and Countershaft Drive.





Chain Driven Reciprocating Pump.



Principle of the Silent Chain Gearing. Chain entering and leaving the Sprocket.

An idea of the varied application of chain drive can be obtained from the different examples submitted in the illustrations used in this article. In Canada chain drives are in frequent use. At the Dominion Oilcloth Company's works in Montreal they have experimented with both chain-driven and gear-driven callenders. An examination of the oilcloth, made with the gear-driven machines, shows the light reflected by a series of waves corresponding to the teeth on the gear. The work turned out by the chain-driven machines, owing to the large number of teeth meshing the surface, is, on the other hand, perfectly smooth. The chain drives are at the shops of the Canada Car Company, at Montreal. Chains were substituted by this company for the operation of wheel-lathes driven by individual motors, after a trial of three years duration of both chain and gear-driven machines. Many Canadian firms have tried out chain driving with considerable success, and its efficiency has been sufficiently proved to warrant its employment to a greater extent in the future, and undoubtedly we shall shortly see considerable increase over the number of chain drives in use in Canada.

### Unique Construction at North Hatley

The report of the reconstruction of the power plant on the Massawippi river of the Eastern Townships Electric Company, of North Hatley, Que., is very interesting on account of the difficulties of construction that were

met with and of the unique methods involved in overcoming them.

The original water-power equipment at this point consisted of open wood flume intake, upright wheels of large diameter, crown gear pinion, etc. This has been replaced by a pair of 27-inch Crocker horizontal turbines, with extended case to new and modern bulkhead, all set on stone and concrete foundations.

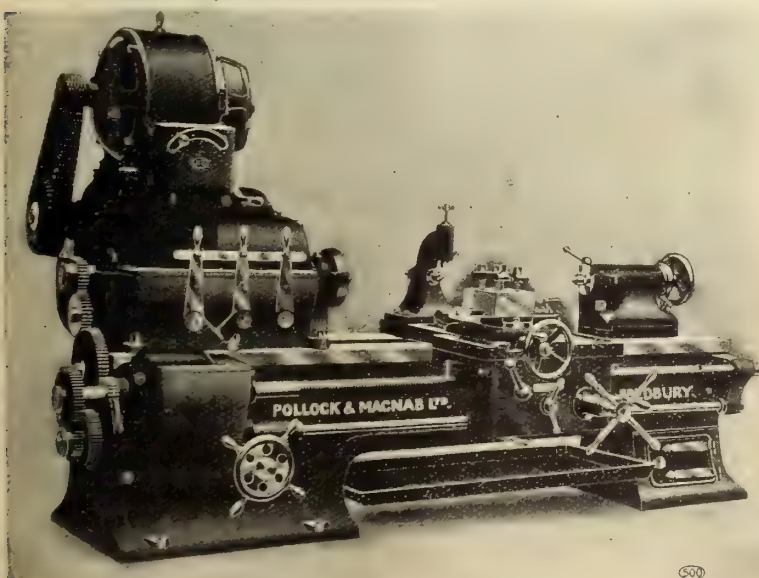
The plant, including the dam, was built on solid clay, and as the water was at all times running over the dam, and the excavating was proceeding just below the end of the dam, much difficulty was experienced in keeping the clay from sliding in on all sides and thus undermine the dam. This was successfully accomplished by planking the sides and wedging timbers between, as fast as the clay would be taken out. In this way a hole eleven feet deep by thirteen feet wide by thirty feet long was dug without any serious slipping of the clay.

Down stream, some 1,200 feet from the power house site, an additional head of six feet could be obtained, and as the cost of a steel flume of that length and sufficient diameter was out of all proportion to the extra power derived, a timber and stone crib was built, dividing the river from the tail race, and the tail race excavated. The crib was made tight on the river side by plank battons and filled with clay from the excavating. In this manner the head was obtained at a comparatively small cost. It will be noted that the wheel had been previously set to take in this additional head.

During the progress of the work, part of the Eastern Township Company's light was supplied directly from the mains of the Eustis Mining Company's plant, and the remaining lights were taken from the company's own lighting machine, driven by a 200-k.w. generator operating as a synchronous motor, the energy also being supplied by the Eustis Mining Company's plant.

With the improvements just made the capacity of the plant has been practically doubled and contracts have been closed for the extra power. The wheels were manufactured by the Jenkes Machine Company, of Sherbrooke, and are governed by a Woodward compensating governor. The engineering work was in charge of F. C. Davis, formerly with the Eustis Mining Company.

Under favorable conditions an average person does not experience any sensation from an electrical current until the tension reaches about 35 volts. From this voltage up there is a gradually increasing sensation.



Heavy Cutting Lathe, driven by Chain.



# TELEPHONE TOPICS

## The New Bell Telephone Exchange Building in Toronto

Already considerable progress has been made with the foundation work of the new exchange office which the Bell Telephone Company is erecting on Adelaide street in Toronto. The new structure is the outcome of the expansion of the company's business, and the consequent inadequacy of the present Temperance street exchange.

When completed, the company will have a model telephone building and its "U" shape will afford excellent facilities for obtaining the maximum light and ventilation. At present the building will be made five

Ontario department and their staffs will be assigned quarters in this space.

We give herewith a plan of the fourth floor. Practically the whole of the front and of the west wing of the fourth floor will be occupied by the power and terminal apparatus.

It is the intention eventually to have two exchanges in the building. The first operating room will be on the fifth floor and the future one will probably be on the third floor; the terminal and power room being made large enough to contain equipment for both exchanges. The apparatus will be of the standard No. 1 relay type, the switchboard being equipped with the No. 92 jack.



Front Elevation—The New Adelaide Street Exchange.

storeys in height, but the structure will be made strong enough to carry two additional floors, which will ultimately be added. On Adelaide street the frontage will be 105 feet and the total depth of the building will be 150 feet. The new office will be of the skeleton type of construction, there will be slightly over 1,000 tons of steel used in the construction, all of which will be encased and fire-proofed with brick curtain walls and terra cotta arch floors. The Adelaide street front will be of red stone and brick of a simple, typical modern office appearance, as shown in the cut.

The boilers, elevator equipment, heating apparatus and the mechanical plant will be located in the basement. The second and third floors will, for the present, be rented for offices, and sub-divided to suit tenants. The district superintendent, district managers of the

The underground cables will be carried in ducts up the west wall of the building to the fourth floor, where they will be terminated in the usual manner on a No. 4B main distributing frame which will primarily be large enough for one office and extendable so that it can accommodate a second. The other racks, batteries, charging equipment, test board and desks are located in the west wing and along the front, and arranged in the usual manner.

The entire fifth floor is given up to operating rooms; the west wing accommodating the local A & B boards, while the east wing will be devoted entirely to long distance work.

The L. D. boards will be placed close to the walls, and the recording boards down the middle. The local switchboard will have accommodation for 9,600 lines and the long distance boards will, it is expected, have ca-



capacity enough for many years to come. All the apparatus will be of the very latest type.

When the second exchange is installed it will be placed either on the office floor immediately below the power room, or in a new storey which may be added to the building. The building will afford ample facilities for the accommodation for at least 20,000 subscribers' lines.

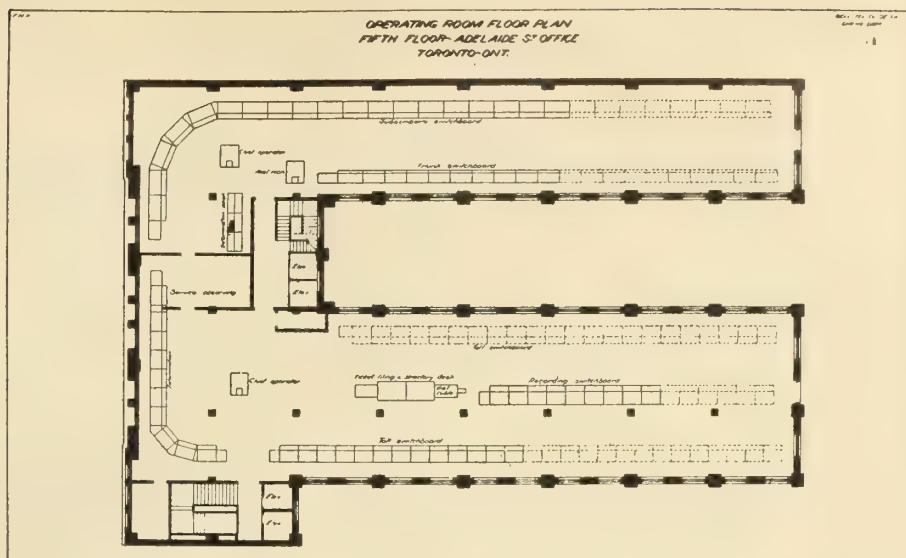
The whole of the east half of the fourth floor will be laid out for operators' quarters. The operators will enter directly from their special elevators into a large, light locker room, large enough to give ultimately accommodation for about seven hundred. This room will be equipped with a commodious clothes dryer, and adjacent to it will be a hospital room, bath room, toilet and lavatories, lunch and retiring room, and retiring room for chief operators and supervisors. There will also be provided in connection with these quarters a paymaster's office.

On the rear end of each wing, from the top to the ground, will be large, easy fire escapes of the most up-to-date type.

The general interior finish of the building throughout will be simple and plain, but all the materials used will be the best of their kind, particularly in relation to their fire-proof qualities. Impervious floors and wainscoting will be employed in the public halls and lavatories. Commodious lavatories, equipped with first class plumbing, will be provided on all the floors. The windows practically throughout will have metal frames and sashes filled with wire glass. All stair cases will be of iron with slate treads, and wood work will be eliminated.

### Manitoba Telephone Extension

At the present time there are in use in Edmonton 1,250 telephones, and including extensions about 1,500



telephones. Last year with the old system overloaded there were only about 600 telephones in use. The main reason for the rapid increase in the telephones in the city is the moderate rates. Residential phones cost \$20 per year, and business phones \$30. Arrangements will probably be made shortly whereby a proportion of the \$200,000, which the new system cost, may be written off each year. Any surplus remaining after these charges are satisfied will go towards the reduction of rates.

### Good Advice to Builders of Rural Telephone Systems

A few solid hints on methods of constructing telephone lines are given by the "Maine Farmer," and should be worth remembering:

1st. Build good substantial lines, always providing for future growth

2nd. Allow only fifteen to twenty telephones on each pair of wires, but get as many subscribers as possible, because every additional telephone adds to the value of every

other telephone in that each subscriber has the advantage of a great field to call on. So, in large neighborhoods, two or three pairs of wires should be strung from the central in order that central may not have difficulty in calling the subscribers and that messages may be transmitted readily.

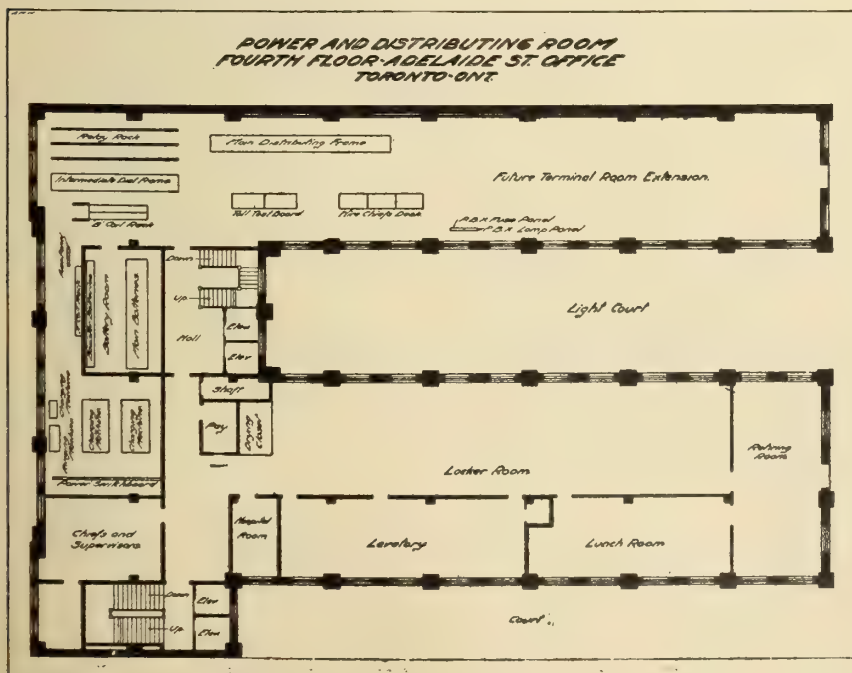
3rd. Try to get the business men of the town to go in with you so as to have the advantage of calling their stores as your needs may demand.

4th. Run clean wires from one central to another, so that through service may be had without interfering with the lines.

5th. Use No. 10 wire, well galvanized, on the main lines, and No. 12 or 14, or copper wire, for the wires running from the main line to the house.

6th. At the organization of the company have adopted some by-laws which will cover your needs, and then go by these rules.

7th. Above all things, avoid friction in the service between subscribers, as the best way to secure a good service is by hearty co-operation of all subscribers.





# Current News and Notes

## Berlin, Ont.

The ratepayers have approved a bylaw to raise \$19,000 for double tracking a section of the street railway track between here and Waterloo.

## Brockville, Ont.

It is reported that a power company will develop 50,000 horse power on the Gati-neau river, near Ottawa, and that they contemplate the erection of a transmission line to supply Brockville with 20,000 horse power.

## Cobalt, Ont.

The Mines Power Company, Limited, are building a ten-thousand horse power hydro-electric plant for supplying power to the various mines in the Cobalt camp.

## Clareholm, Alta.

Bylaws to establish a lighting system and waterworks were recently carried by the electors.

## Chatham, Ont.

It is reported that the Windsor, Essex and Lake Shore Electric Railway will be extended to Chatham and London from its present eastern terminus at Leamington. Spur lines will also be constructed on this new route.

The C. W. & L. E. Railway are stated to be considering the extension of their system to Pain Court. This extension will mean the building of three and one-half miles of road. The Pain Court line will branch off at Glover's in Dover, following a right of way along the Blind road to the Bear line, then south to Dover town hall to the fourth concession.

## Dawson, Yukon.

The Northern Light, Power and Coal Company, Limited, have been incorporated with a capital of \$3,000,000, to carry on business as a light, heat and power company. The provisional directors include E. H. Thurston, A. Haydon and W. C. Greig.

## Edmonton, Alta.

A company represented by R. Brutinelle is negotiating with the city council for the purchase of the inter-urban franchise of the street railway. If an agreement is effected, the company will build as far as the White Star coal mines, seven miles distant on the proposed route to Pigeon Lake, this summer. Among other things the company agrees to purchase the charter now owned by the city of Edmonton, which was purchased last year from the Stratheona Radial Tramway Company and which grants to the company the right to construct radial lines within a radius of eighty miles from the centre of the city of Stratheona.

## Fernie, B.C.

The city council of Fernie is negotiating for a new site for the electric light and power station.

Negotiations are in progress for the purchase of a tract of land near the coke ovens to be used for the new power house site.

## Fort William, Ont.

The Joint Street Railway Board of Fort William and Port Arthur in recent session passed a resolution urging the city council to at once secure auxiliary apparatus for the street railway power house, in the shape of an extra motor generator set. A

resolution was passed suggesting that both old and new cars be lettered "Twin City Electric Railway." A report from Manager Pilcher stated that delays in service were due to the construction work at Fort William; employees had short-circuited the line and burned out the Kam generator. The company have several new cars under construction at the Preston, Ont., shops.

## Hamilton, Ont.

Justice Teetzel recently granted a continuance of the injunction, until September 27, 1909, to restrain this city from making application to the Hydro-Electric Commission for power. This is pending the trial of an action to quash the by-law that was recently adopted favoring the making of an agreement with the Commission.

## Hensall, Ont.

A. G. Smilie, clerk of this municipality, invites tenders for a hundred miles of telephone line and some two hundred instruments.

## Kingston, Ont.

Retaining dams to regulate the water supply during the dry season will be built at Gull and Long Lakes. The companies along the Mississippi river will be assessed for this water according to the benefits derived. This move is considered to be the first step towards the consolidation of all the power companies in the neighborhood.

## Lacombe, Alta.

The Blindman River Electric Power Company may construct a transmission line to Red Deer, Alta. E. J. Tett is secretary and general manager.

## Moncton, N.B.

The following contracts have been awarded in connection with the city's electric light plant: Generator, Canadian General Electric Company, \$6,470; engine, Robb Engineering Company, \$5,448, and boiler, \$1,040; No. 4, weather-proof wire, Wire and Cable Company, \$613.70.

## Moose Jaw, Sask.

Tenders addressed to J. D. Simpson were received until July 19th for the following material: One 50 light, constant current transformer or regulator, with 35 arc lamps and suitable switchboard, with necessary instruments for controlling same; contract for one year's supply of Watt meters; a contract for one year's supply of transformers.

## Moosomin, Sask.

Tenders addressed to J. H. Young, Secretary, Moosomin East Rural Telephone Company, were received until July 10th for the construction of the company's system.

## Montreal, Que.

The members of the Montreal Stock Exchange have signed a petition to the Governor-General-in-Council, praying for the disallowance of the Act of the Ontario Legislature, passed at the last session, validating certain contracts entered into by the Hydro-Electric Power Commission and the municipalities of the province.

The Montreal Light, Heat & Power Company have entered an action against the city to recover \$86,378. This represents the cost price of the current supplied to

the city by the company for the first six months of 1909. At the expiration of the old contract the company agreed to furnish light at cost price until a new agreement was made. The city want to compromise by paying \$60 per lamp.

## New Hamburg, Ont.

The electors of Wellesley Township have carried a by-law to take \$15,000 stock in the People's Electric Railway.

## Peterborough, Ont.

The special committee appointed to negotiate with the Central Power Company regarding the acquiring of Burleigh Falls power has decided that \$50,000 is a fair valuation. The company asks \$125,000.

## Port Arthur, Ont.

The city council have decided to construct an extension of the street railway, and tenders will shortly be invited for material, and labor. J. J. Antonisen is the city engineer.

## Quebec, Que.

A consolidation of all the electrical development companies in and about the city of Quebec, will likely take place in the near future. The new company will make considerable changes and will be capitalized at \$8,000,000.

The annual meeting of the stockholders of the National Telephone Company was held recently and as a result of the election the following officers and directors were chosen: President, Joseph Paquet, Levis; vice-president, Hon. Ad. Turgeon; secretary-treasurer, E. Beaubien, Levis; general manager, J. F. Demers, Levis, and the directors are: George Demers, Neuville Belleau, Hon. Richard Turner, A. B. Dupuis and Henry D. Barry, all of Quebec; Etienne Dusseault and Ed. Couture, Levis, Quebec; J. H. Frechette, Ste. Claire, Quebec; John McWilliams, of Father Point, Quebec.

## Regina, Sask.

The ratepayers have voted in favor of the proposition to issue \$78,000 in bonds, the proceeds to be used for the construction of a municipal electric light plant.

## Stratford, Ont.

The city council have decided to offer the Stratford Gas Company \$3,000 for their complete electrical outfit.

Negotiations are in progress for the purchase of the Pratt farm for the erection of the Hydro Electric Commission's transmission station. The building will be 100 feet by 80 feet. Practically nothing has been done towards the distribution of the 1,000 horse power which the city has contracted for.

## St. Thomas, Ont.

D. W. Yates, the engineer of the Hydro-Electric Commission submitted to the city council at a recent meeting, the estimates of the cost of constructing a plant for the distribution of Niagara power. For an entire new plant for all purposes the figures were \$83,620, with alternate propositions which would mean the remodelling of the present plant for \$82,810. The council decided to accept the former proposition, and will ask the ratepayers to sanction the expenditure. The result of their decision will mean that the ratepayers will be asked to vote an additional \$41,000 towards the cost of constructing the distributing



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plant. A year and a half ago the ratepayers voted \$42,000 towards a plant, which meant the erection of the wires from the Hydro-Electric Power Commission's station outside of the city to the city's distributing station, and from there to the power users, but did not include the extension or renewing of the street lighting, the incandescent or the street railway systems. The present estimate covers everything, including the costs of engineering.

### Toronto, Ont.

The officials of the Ontario Hydro-Electric Commission were recently in conference with the members of the Board of Control with a view to fixing a site for the transformer station. This building is to be 200 feet by 150 feet. No definite selection was made.

Tenders for the new power stations at Niagara and Dundas were opened by the Hydro-Electric Commission recently. They were referred to the engineers for classification.

The Ontario Gazette records the cancellation of the charter of the Northumberland-Durham Power Company, Limited, who had obtained operating rights at Healey's Falls, on account of non-fulfilment of conditions of lease.

The Hydro-Electric Power Commission is receiving tenders for the construction of transformer and interswitching station buildings at Toronto, London, Guelph, Preston, Berlin, Stratford, St. Marys, Woodstock, Paris and St. Thomas.

The Erindale Power Company, which recently acquired from the liquidators of the Southern Light & Power Company the power station on Credit River, Ont., and land holdings at Port Credit harbor, is now arranging to proceed with the construction of the dam and the erection of buildings for the housing of machinery at the station with a view to delivering 1,000 horse-power to the distributors, the Stark Telephone, Light & Power Company, in Toronto, within six months. English capitalists are behind the power scheme. The capacity will be increased as the demand warrants.

### Victoria, B.C.

The British Columbia Electric Company is reported to have awarded to Malcolm & Dinsdale the contract for an addition to its plant on Store street. Probable cost of work, \$50,000.

Preliminary surveys have commenced in connection with the Victoria and Barclay Sound Electric Railway, which will be built to connect the west coast of Vancouver island with the deep water connection at Esquimaux.

The management of the British Columbia Electric Railway Company has submitted to the civic authorities an agreement whereby the company will expend within the next two years nearly \$2,000,000 in the development of a plant for the generating of electrical energy, probably on the Jordan river, where water rights were staked several years ago, and the extension of the tram and power and light systems on the southern part of the island. The agreement was endorsed by the council, and the solicitor was directed to draw up a bylaw embodying the terms for submission to the electors of the city.

### Vancouver, B.C.

The British Columbia Electric Railway have awarded T. R. Nickson & Company the contract for the grading of the Fourth avenue west extension of its line from Granville street to the west city limits.

Tenders were received until July 12th for the construction of a portion of the Fraser Valley branch of the British Columbia Electric Railway Company.

The British Columbia Electric Railway Company has called for tenders for the construction of an extension of its car barns at Mount Pleasant. The cost of the work will be about \$15,000.

The British Columbia Electric has purchased a terminal site at Huntington on the boundary line. The Chilliwack line will be extended there. It is likely that it will connect with the American line to Bellingham.

### Walkerville, Ont.

The Canadian Bridge Company have completed one thousand steel towers for the transmission line of the Ontario Hydro-Electric Commission. This company holds a contract for the supply of 3,000 of these towers and will deliver them in ten monthly shipments.

### Winnipeg, Man.

The Northwestern Battery Company, Limited, has been organized to manufacture electrical appliances and will shortly arrange for a factory site.

The installation of a telegraphone system of despatching was recently completed on the C. P. R. between Winnipeg and Medicine Hat, Alta.

### West Toronto, Ont.

The Toronto Suburban Railway Company was recently given a new lease by the railway committee. It is stated that the company proposes to continue its line at present built to Weston, up to Brampton and along through Peel, Wentworth, and Welland Counties to Port Colborne. It also proposes to continue its line at present built as far as Lambton Mills along to Hamilton and on through Wentworth and Lincoln counties to Niagara Falls. It was decided to give the company two years in which to start and five to finish the work.

### AWARDED.

### Cobalt, Ont.

The contract for the construction of the proposed electric railway between Cobalt and Haileybury has been awarded to the Nova Scotia Construction Company, of Sydney, for \$125,000. The railway will eventually be connected with North Bay.

### Kamloops, B.C.

Contracts for additional steam and electrical equipment for the municipal electric light plant, to cost about \$13,000, have been awarded as follows: To the Canadian Westinghouse Company, Montreal, Que., for engine and generators, and the Canadian Fairbanks Company, Montreal, Que., for boilers and condensers.

### St. John, N.B.

A company headed by W. R. Gould, of Aroostook Falls, Me., has awarded to Murray Bros., of Houlton, the contract for the construction of the twelve miles of electric road from Presque Isle to Washburn. Operations have already been commenced.

### Westmount, Que.

Contracts for the extension of the electric light plant have been awarded as follows: Canadian Westinghouse Company, switchboard, \$1,285; Caledonia Iron Works, cooling tower, \$2,900; Darling Bros., feed water heater, \$700; Canadian Crocker-Wheeler Company, generator and accessories, \$4,650; Belliss & Morecom, England (Laurie & Lamb, agents), compound condensing engine, etc., \$7,000.



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### Progress of the Hydro-Electric Line

The members and head engineers of the Ontario Hydro-Electric Power Commission recently made a tour of inspection over the complete right-of-way of the proposed transmission lines. In the party were: Hon. Adam Beck, Mr. P. W. Sothman, chief engineer; Mr. H. G. Acres, engineer in charge of the transmission line, and Mr. R. A. Ross, chief consulting engineer of the Commission. They expressed satisfaction at the progress made, and report that eighty per cent. of the right-of-way easements have been secured, locations obtained for the transformer stations. Eight miles of telephone wires have been erected near Toronto, and 6,000 poles and the necessary wires are ready for erection. Seventy towers to carry the transmission line are on the ground, and from 60 to 70 are being delivered weekly by the Canadian Bridge Company, of Walkerville.

### Electrical Display at the Toronto Exhibition

The display in the Manufacturers' Building at the Canadian National Exhibition this year promises to eclipse anything ever seen there before. Every inch of space in the building, which covers two acres of ground, was applied for three months before the opening of the Fair, and as more applications are pouring in every day, the management have been able to select exhibitors who put in an attractive display. There is no better evidence of the growing popularity of the Canadian National than the anxiety of the manufacturers to display their wares there. The Transportation, Manufacturers', Administration and Process Buildings will be electrically illuminated, and the grand piazza will be one blaze of light during the evenings.

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Date.	Light.	Date.	Extinguish.	No. of Hours
Aug. 1	No Light	Aug. 1	No Light	
2	7 40	2	9 50	2 10
3	7 40	3	10 20	2 40
4	7 40	4	10 50	3 10
5	7 40	5	11 20	3 40
6	7 40	6	11 50	4 10
7	7 30	8	0 20	4 50
8	7 30	9	0 50	5 20
9	7 30	10	1 30	6 00
10	7 30	11	2 10	6 40
11	7 30	12	3 00	7 30
12	7 30	13	4 00	8 30
13	7 30	14	4 20	8 50
14	7 30	15	4 20	8 50
15	7 30	16	4 20	8 50
16	7 20	17	4 20	9 00
17	7 20	18	4 20	9 00
18	7 20	19	4 30	9 10
19	7 20	20	4 30	9 10
20	7 20	21	4 30	9 10
21	7 20	22	4 30	9 10
22	7 20	23	4 30	9 10
23	7 10	24	4 30	9 20
24	7 10	25	4 30	9 20
25	10 30	26	4 30	6 00
26	11 20	27	4 30	5 10
28	0 20	28	4 30	4 10
29	1 30	29	4 40	3 10
30	No Light	30	No Light	
31	" "	31	" "	

Total.....182 10

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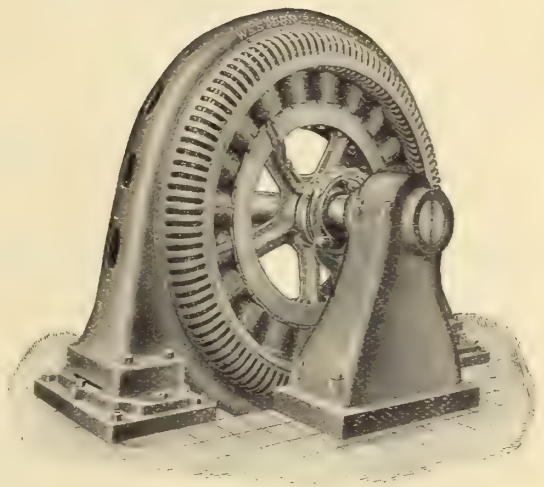
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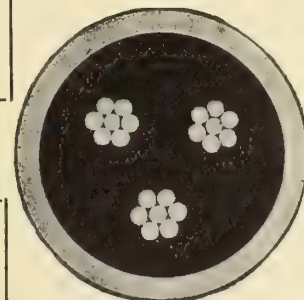
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## Electrical Contracts Awarded

## Cobalt, Ont.

The contract was recently awarded to the Standard Construction Company, of Montreal, for the erection of a double transmission line between Cobalt and Metabetchouan. The line will be about twenty-five miles in length.

## Fort William, Ont.

The contract for the rewiring of the basement and ground floors of the Fort William post office building has been awarded to the Western Electric Supply Company of this City.

The contract for the electrical equipment of the power house to furnish power to operate the new Grand Trunk Pacific swing bridge over the Kam river at West Fort William has been awarded.

## London, Ont.

The Colonial Engineering Company, of Montreal, have been awarded the contract for the installation of a 300 h.p. suction gas plant.

## Michel, B.C.

The Michel Water, Light & Power Company has been incorporated to supply that town with commodities named.

## Montreal, Que.

The Montreal Light, Heat and Power Company have just placed a large order with the Canadian British Insulated Company, Limited, Montreal, for electrolytic copper, to be made into cables, delivery to be made early in 1910.

The Colonial Engineering Company, Limited, have just been awarded the contract from the Dominion Light, Heat & Power Company for the supply of a 1,000 horsepower Hornsby-Stockport gas engine equipment consisting of three 250-h.p. twin cylinder Hornsby-Stockport gas engine units and two 125-h.p. units. The Dominion Company will erect a concrete building to generate three phase 60-cycle alternating current for distribution for power and lighting in Montreal.

## Niagara Falls, Ont.

The contract was recently awarded to the Canadian Westinghouse Company for the supply of a number of transformers. The Canadian General Electric Company also tendered.

## Pembroke, Ont.

The contract for supplying an electric pump and motor has been awarded to the Caledonian Iron Works Company at a cost of \$5,980.

## Port Arthur, Ont.

The contract for the construction of the power dam at Dog Lake has been awarded to Wm. White, Burlington, Ont., at an estimated cost of \$40,000. The work will be completed by December 31st.

## Regina, Sask.

The Department of Railways, Telegraphs and Telephones of Saskatchewan have just awarded the contract for a large supply of air space paper insulated lead covered telephone cables to the Canadian British Insulated Company, Limited, of Montreal.

## Toronto, Ont.

The Toronto Street Railway Company recently awarded to the Canadian British Insulated Company, of Montreal, a contract for the supply of high tension cables.

The Board of Control have awarded to Golden & Slansing, of Troy, N.Y., the contract for the laying of conduits in connection with the civic electrical plant. The firm's tender, \$55,801, was the lowest.

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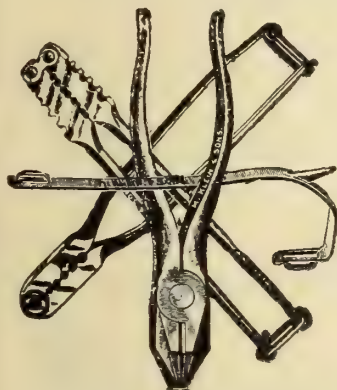
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For the past 52 years, we have concentrated our efforts on producing work of quality, and have not permitted our name to be used on, or associated with inferior goods. For your

protection in this respect, we mark all goods manu-

factured by us with our full name, "M. KLEIN & SONS." Tools marked or advertised Klein Pattern are not our tools. Insist on the

LINE which always bears the full name.

Write for our new catalogue and price list.

## Mathias Klein & Son

Manufacturers and Jobbers of Electrician's,  
Linemen's and Construction Tools

Station U 23, Chicago, Ill.



Canadian Factory  
Niagara Falls, Ontario

## Goold Electrical Construction Co.

Phone M. 5043 Room 114 Stair Building, TORONTO

### Electrical Engineers and Contractors

We are experts on Elevator, Mill and Power House work, High Tension Transmission Lines and Electrification of Industrial Plants, Examination Estimates, Reports, Plans and Specifications furnished for all systems.

We enter into contracts for the complete installations of Power and Lighting Systems.

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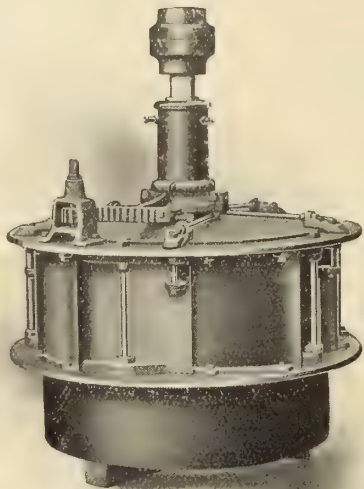
A. W. FABER'S

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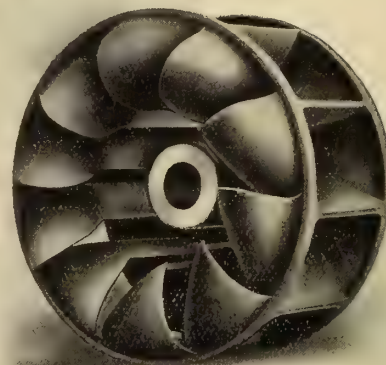
NEWARK,  
New Jersey, U. S. A.  
Manufactory Established 1761

# The "Canadian" Turbine Water Wheel



All that is good in Turbine Water Wheel construction is embodied in The Canadian Turbine.

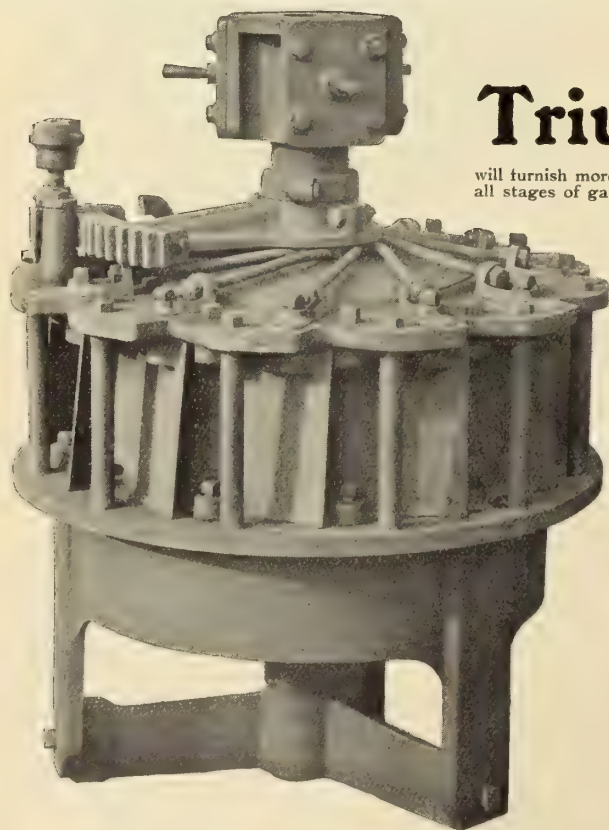
You want an ideal drive for your plant and we are prepared to provide this for you under absolute guarantee.



We Manufacture Turbine Water Wheels and Water Power Equipment only.

**CHAS. BARBER & SONS, MEAFORD, ONTARIO**

Established 1867

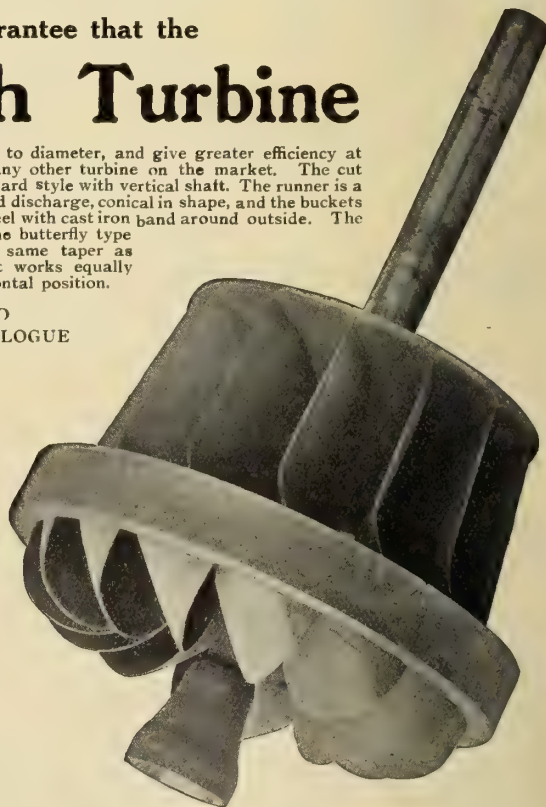


We Guarantee that the

## Triumph Turbine

will furnish more power according to diameter, and give greater efficiency at all stages of gate opening than any other turbine on the market. The cut shows our standard style with vertical shaft. The runner is a single downward discharge, conical in shape, and the buckets are wrought steel with cast iron band around outside. The gates are of the butterfly type and set on the same taper as the runner. It works equally well in a horizontal position.

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# Better Than Ever

We are in a better position than ever to handle your trade, and we want a chance to quote on your requirements. We make a specialty of giving Western Canada orders prompt and careful attention. :: :: :: :: ::

Why put up with unsatisfactory service when the best is within your reach?

**Washington  
Electrical Supply Co.**  
SPOKANE - WASH.

## The New Weston Portable Alternating Current Ammeters, Milli-meters and Voltmeters



are so far superior to those of any other manufacture that their performance will be a revelation to users of alternating current apparatus.

They are **absolutely dead-beat and extremely sensitive.** Their indications are **practically independent of Frequency and of Wave Form.**

They are **practically free from Temperature Error.**

They require **extremely little power for operation.** They are **remarkably low in price.**

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New York Office: 114 Liberty St.

London Branch—Audrey House, Ely Place, Holborn  
Paris, France—E. H. Cadiot, 12 Rue St. Georges  
Berlin—Weston Instrument Co. Ltd., Ritterstrasse, No. 88

Selling Agencies in Canada:

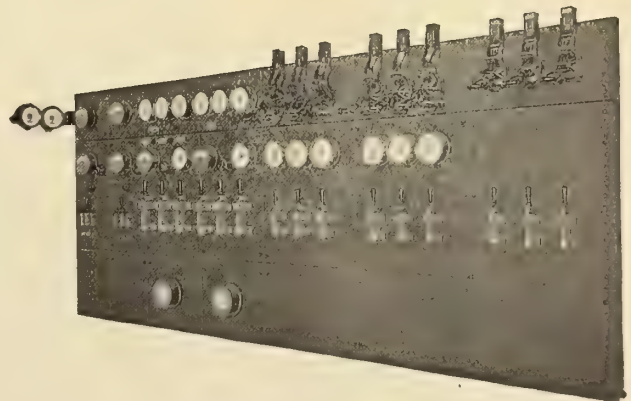
Toronto—A. H. Winter Joynner, 6 Wellington Street East  
Montreal—Engineering Equipment & Supply Co., 13 St. John Street

# Westinghouse Switchboards

The Standard panel sections adopted by the Westinghouse Company are the result of extensive experience which has demonstrated that the panel dimensions selected, secure the best results in design, operation, maintainance, appearance and economy of space, to which sections of equal height do not readily lend themselves.

The board illustrated is made up of Westinghouse standard panels for the heaviest capacity of low tension, alternating-current service, for use on circuits of 500 volts or less.

Send for Switchboard Circular 1504



Westinghouse Type G.A. Heavy Capacity A.C. Switchboard

## Canadian Westinghouse Co., Limited

GENERAL OFFICE AND WORKS: HAMILTON, ONT.

Traders Bank Bldg.  
TORONTO.

439 Pender St., VANCOUVER.

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232 St. James Street,  
MONTREAL.

158 Granville Street, HALIFAX

# 17<sup>3</sup>/<sub>4</sub> CENTS

in Barrel Lots of 125



In the New Type of  
**XCELL**  
"Model 1910"

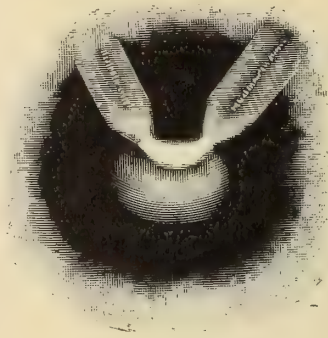
we have increased the efficiency **18 per cent.** and have improved the appearance greatly.

**We guarantee** the new type to be better than **ANY** other battery on the continent.

Ask for the X Cell with **Red Top** and the Black Cat.

**Electrical  
Specialties  
Limited - Toronto**

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"Fabius  
Henrion"  
**Carbons**

are made

Thou shalt use "FABIUS HENRION"  
Carbons and no others.

Thy life will be a source of pleasure.

Thou wilt live in comfort.

Thou shalt not support the American Trust,  
who are robbing My Good Canadian  
People.

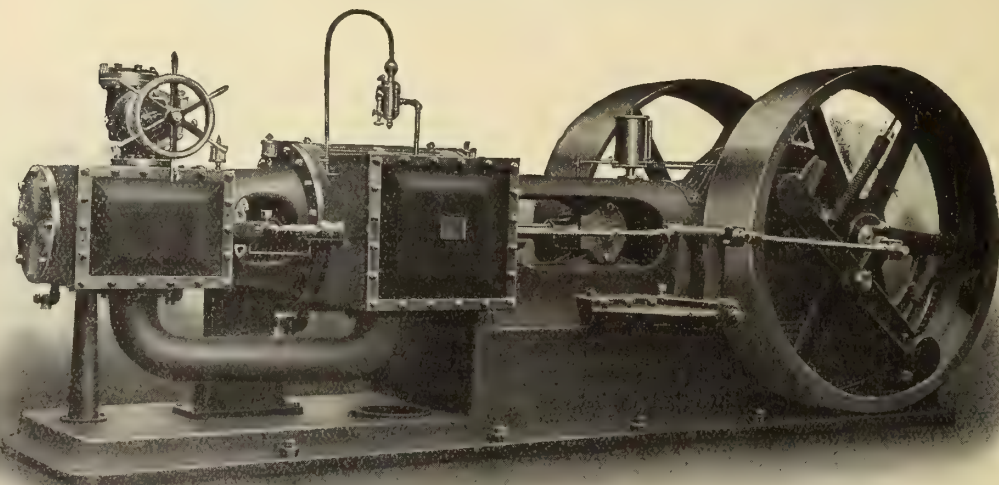
Thou shalt write for FREE SAMPLES to the

**Canadian National Carbon Co., Ltd.**  
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Thou Wilt Save Money

## THE McEWEN HIGH SPEED AUTOMATIC

In Simple and Compound Units



Unexcelled  
for  
Simplicity  
Efficiency  
and  
Economy

17-28 x 20 Tandem Compound.

Write For Latest Bulletin and Prices.

**Waterous Engine Works Co.**  
BRANTFORD, CANADA



## Central Station Men



The A. & W. One Light Signs are made to conform with all lines of business. The watch sign as above and, along the same line, a hat, a mortar, and a sign made with barber poles.

quickly realizing the advantages of our proposition have answered our former ads promptly. However, there may be a few stations we have not heard from. Should you be one, do not delay, give your stenographer a letter **NOW**, and let us fully explain to you the one great proposition

### The A. & W. One Light Electric Signs

They encourage the use of electric light. Put consumers on your line you otherwise never could get.

**THE ONE LIGHT SIGN** without question increases a firm's business and in consequence puts the electric light user above the standard of business men

Write us to-day, delay means direct loss to your station.

**The A. & W. Electric Sign Co.**  
56-64 Farley Ave, TORONTO

WE MANUFACTURE OTHER STYLE SIGNS

## Death & Watson's Electric Signs

Pay both the **Merchant** and the **Central Station**.

Attractive by day. Unsurpassed at night.

Write us about fancy flashing and motion signs.

**Death & Watson**  
25 Jarvis Street, TORONTO

## For Difficult Work in tight corners there is nothing to equal the Baby Gasoline Torch

The smallest practical torch made. Perfect, powerful and durable. Lights with a match.

This torch is a necessity for every repair kit.

### Burns without Air Pressure

A simple automatic tool, with no movable parts, valves or pump to get out of order or be replaced. Tank is only three inches high and two in diameter. It requires no pumping and is always ready for use. Simply hold a lighted match to the burner—it lights quickly. Will burn steadily for two hours on one filling of gasoline.



This torch will be sent express prepaid to any address in Canada on receipt of \$1.25.

**Crescent Company**

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Queen Inspectors Style Voltmeter

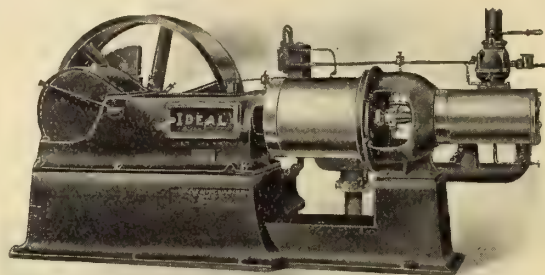
Electrical Instruments for All Purposes

For 30 years the Standard Testing Sets Voltmeters and Ammeters A.C. and D.C. Galvanometers Tachometers Pyrometers, Etc.

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# Ideal High-Speed Steam Engines

Centre  
and  
Side Crank  
Designs



For  
Belted  
or  
Direct  
Connection

## *The* Goldie & McCulloch Co., Limited

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248 McDermott Ave., Winnipeg, Man.

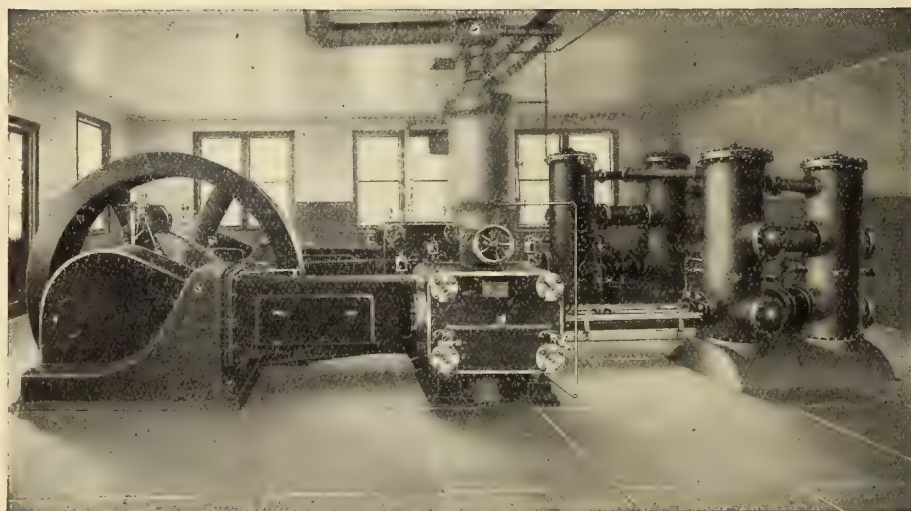
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**WE MAKE** Wheelock Engines, Corliss Engines, Ideal Engines, Gas Engines and Producers, Boilers, Tanks, Heaters, Steam and Power Pumps, Condensers, Flour Mill Machinery, Oatmeal Mill Machinery, Wood-Working Machinery, Transmission and Elevating Machinery, Safes, Vaults and Vault Doors.

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# Robb Power Plants



## Engines

Corliss, Slide Valve,  
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Return Tubular, Water  
Tube, Internally Fired,  
Portable.

## Robb Engineering Co., Limited - Amherst, N.S.

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# Your Repair Work Deserves Better Attention

than it is probably getting. Our superior facilities enable us to repair all kinds of motors, generators, all station equipment, whether direct or alternating current, starting apparatus, etc.

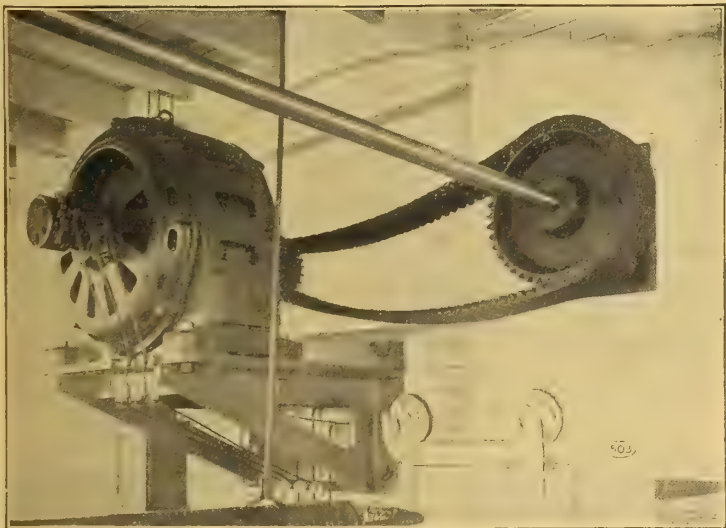
We can also assure good work and quick service in the repair of Commutators, Fields, etc. And can rewind Transformers, Fields and Armatures quickly, and at the same time give the insulation the attention it should have.

## The Electrical Maintenance & Repairs Co.

Long Distance Phone, M. 3419

162 Adelaide St. West, TORONTO

# Renold Silent Chain



is the culmination of all attempts to make a perfect HIGH SPEED DRIVING CHAIN, and the varied nature of its installations evidences the success of this method of power transmission.

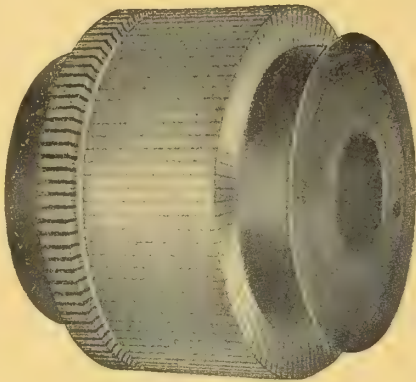
Maintains an EFFICIENCY of 98.2%, has the life of two or three belts, and being COMPACT, effects a saving in SPACE. As it is particularly suited to SHORT CENTRES, and NOT affected by HEAT, DAMPNESS or OIL, its application to motor driven machinery is almost universal.

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## Jones & Glassco, Montreal, Que.

CANADIAN AGENTS

# It's a Money Saving Proposition



to have your repairing properly done. We have built up the biggest repair business in Canada, simply because we give the best possible attention to every order placed with us, whether large or small. Do not throw out the old machinery or equipment when a few dollars spent on repairs will make it as good as new.

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**COMMUTATORS REFILLED**

**TRANSFORMERS REWOUND**

We Can Keep You Running While Repairs Are Being Made.

**Fred Thomson & Co.,**

326-328-330 West Craig Street  
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## MUNDER SOCKETS

ARE REPLACING

ALL OTHER MAKES

ARE YOU SELLING THEM?

**MUNDERLOH & CO., MONTREAL**



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Insulators, Pins, &c.

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**Dawson and Company, Limited**

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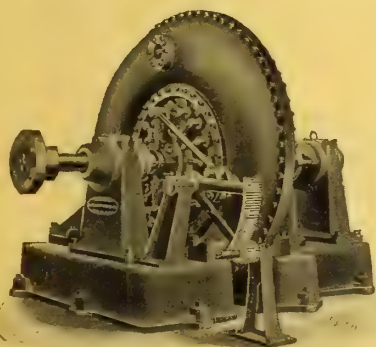
**WINNIPEG**



# Canadian Electrical News

## & Engineering Journal

### McCormick & Francis Turbines



both Cylinder and Wicket Gate, giving **ENORMOUS** power, are used in hundreds of electric power plants throughout the world.

We make a specialty of designing turbines to meet the requirements of the public.

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Branch Offices:  
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### Power and Lighting Transformers



**Type H** Safety  
Economy  
and Durability

A large stock of all standard sizes on hand

Are you prepared for heavy lighting Season ?

**Canadian General Electric Co., Limited**

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Montreal

Halifax

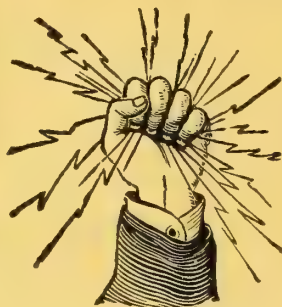
Ottawa

Winnipeg

Vancouver

Rosslund

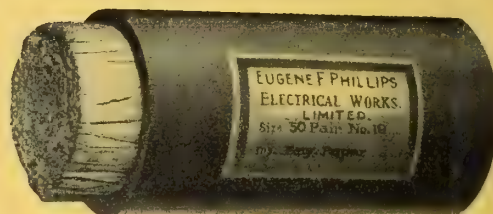
# PHILLIPS



Bare and Insulated Copper

## WIRES AND CABLES

For Telephone, Telegraph, Lighting,  
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Bare and Insulated Electric Wire and  
Cables for Aerial and Underground use

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Weatherproof Magnet  
and Rubber Covered  
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Incandescent and Flexible Cords

## Eugene F. Phillips Electrical Works, Limited

MONTREAL

CANADA

Branches: Halifax, Toronto, Winnipeg, Vancouver



# Benjamin Plug Clusters

CAT. No.

92

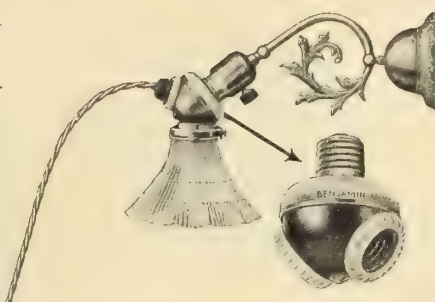
FAN ←

FLATIRON ←

CURLING IRON ←

PORTABLE LAMP ←

SEWING MACHINE ←



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Give You Two Outlets Where You Have But One

Double the Capacity of Your Sockets by Doing the Work of Two

Require No Wiring—Small in Size—Can't Wear Out

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**Benjamin Electric Mfg. Co.,** 64 York Street  
TORONTO

## “DIAMOND H”

### SWITCHES

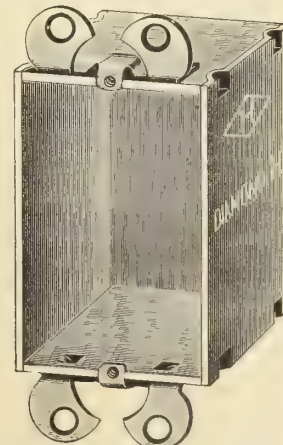
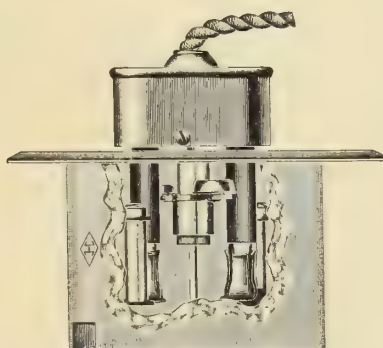
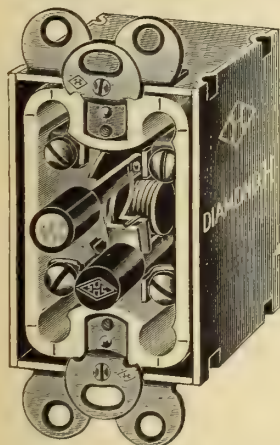
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



### APPLIANCES

Galvanized Steel all Cases  
Automatic Flush Receptacles and Plugs



MANUFACTURED BY THE HART MANUFACTURING CO., HARTFORD, CONN.

Canadian Agents:

**C. W. Bongard Co., Ltd.,**

62-64 Wellington Street West  
**Toronto Can.**

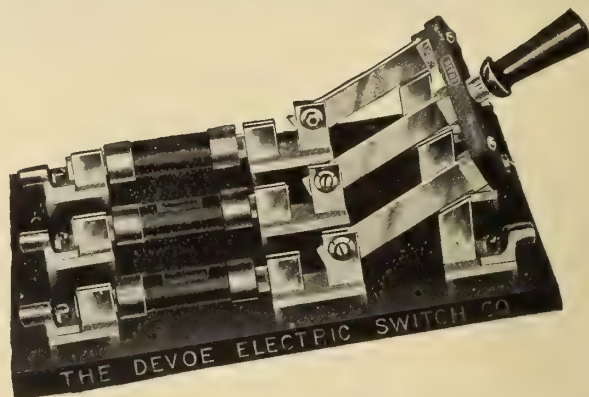
# \$ Money \$

is more plentiful, so it is said ;  
but as yet there is not such a  
surplus of that commodity  
apparent that you can afford  
to be without our latest lists  
and discounts.

Write to-day for Bulletin 1a

The  
**Hill Electric Switch & Mfg. Co.**  
Limited  
MONTREAL

# SWITCHES

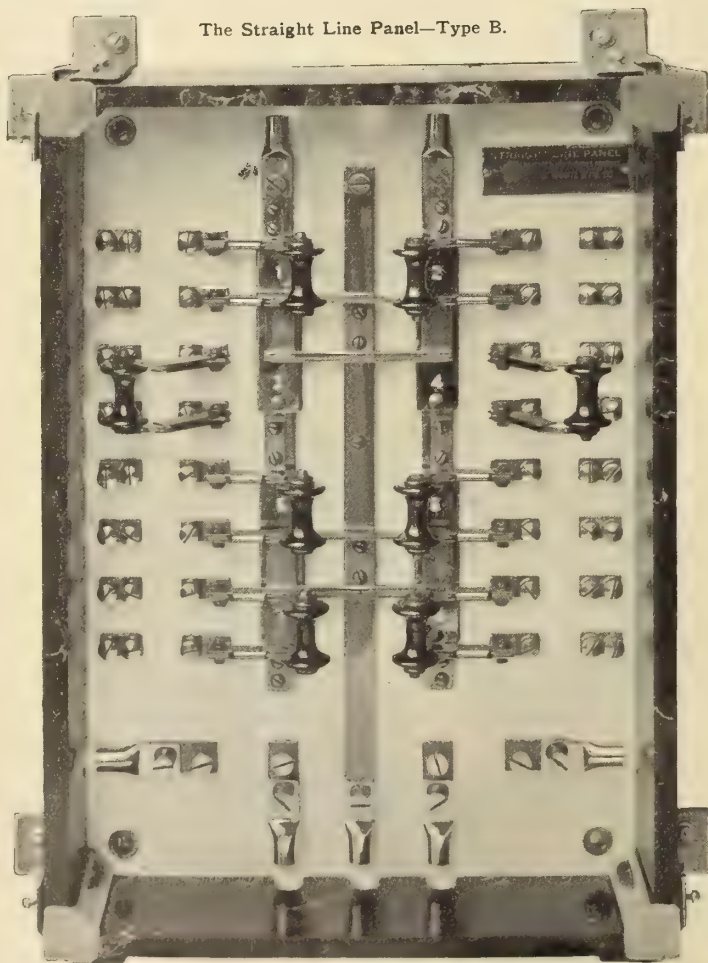



Switchboards, Panel Boards,  
Steel Boxes and Cabinets for  
every purpose.

Send us your specifications  
Write for Switch Catalogue No. 4

The  
**Devoe Electric Switch Co.**  
157 Craig Street West, MONTREAL

The Straight Line Panel—Type B.



 Panel Boards      Tablet Boards  
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# Switchboards KRANTZ

The best of everything in these lines as well as

Floor and Outlet Boxes, Steel Cabinets  
and Trims, Bushings, Etc.

If you have not looked into these lines you want to  
do so on your next contract. Prices as low as any.  
Prompt deliveries. And any information required  
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Limited

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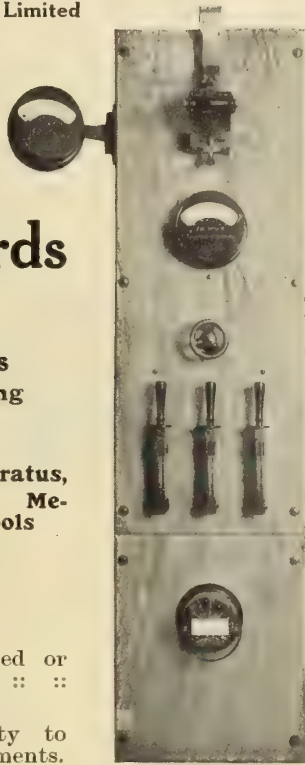
## Switchboards

Sockets  
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Electrical Supplies

2000 Volt Motor Starting  
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Oil Switches

Special Electrical Apparatus,  
Commutators, Special Me-  
chanical Apparatus, ToolsMetal Novelties  
Metal DevicesSpecial Machinery designed or  
built to specifications. :: :: ::We solicit an opportunity to  
quote on your requirements.

## New Weston Eclipse Direct Current Switchboard Ammeters, Milli- Ammeters and Voltmeters



are of the "soft iron" or Electro-magnetic type, but they possess so many novel and valuable characteristics as to practically constitute a new type of instrument.

Their cost is exceedingly low, but they are remarkably accurate, well made and nicely finished instruments, and are admirably adapted for general use

in small plants, the cost of which is frequently an important consideration.

Correspondence concerning these new Weston instruments is solicited by the

**Weston Electrical Instrument Co.**  
Waverly Park, Newark, N.J., U. S. A.

New York Office: 114 Liberty St.

London Branch—Audrey House, Ely Place, Holborn  
Paris, France—E. H. Cadiot, 12 Rue St. Georges  
Berlin—Weston Instrument Co. Ltd., Ritterstrasse, No. 88

Selling Agencies in Canada:

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Montreal—Engineering Equipment & Supply Co., 13 St. John Street

## "SHAWMUT"

## N. E. Code Standard Enclosed Fuses



Very careful tests of various Fuse Constructions as found in different makes of Fuses, under the most severe Short Circuit show that our Fuses act perfectly inside and out.



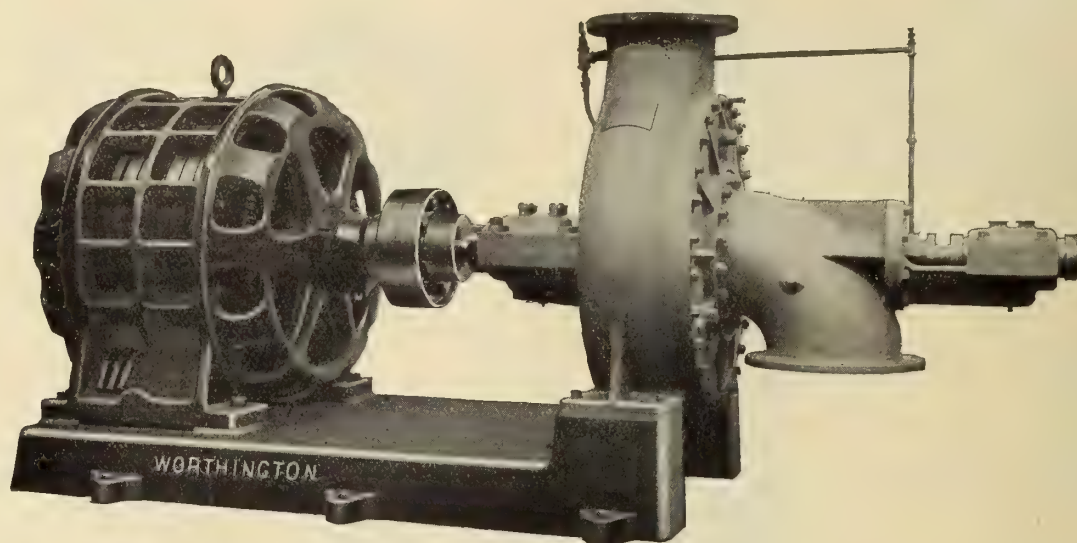
Why Not Try Them?

**CHASE-SHAWMUT CO.**

NEWBURYPORT, - MASS.

# PUMPING MACHINERY

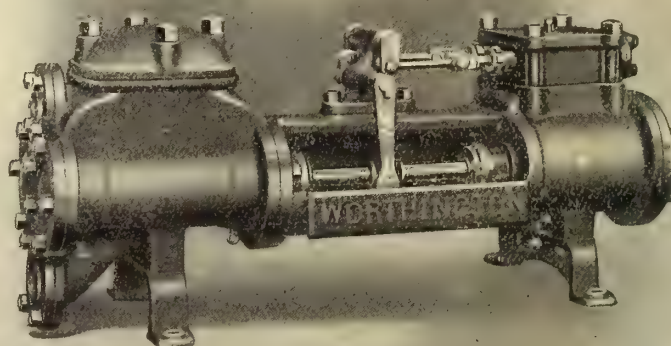
OF ALL CAPACITIES FOR ALL PURPOSES



## TURBINE PUMPS

ONE OF OUR 14 INCH SINGLE STAGE TURBINE PUMPS DRIVEN BY 150 H. P. INDUCTION MOTOR. CAPACITY 5,000 GALS. PER MINUTE.

A LARGE NUMBER OF THESE PUMPS KEPT IN STOCK READY FOR IMMEDIATE SHIPMENT.



## BOILER FEED PUMPS

**THE JOHN McDOUGALL  
CALEDONIAN IRON WORKS CO.  
LIMITED**

Works: Montreal. Sales Offices: Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.





TRADE MARK  
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## The Standard for Rubber Insulation

# Okonite Insulated Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

Willard L. Candee, President.  
H. Durant Cheever, Treasurer.  
Geo. T. Manson, General Superintendent.  
W. H. Hodgins, Secretary.

The OKONITE COMPANY,  
253 Broadway, NEW YORK, U.S.A.

## Meditations on Resistance Measurements

TIME h. m. s.	While using a Battery, Bridge, and Galvanometer
12. 0.0	Where is the spot? (Interval while it is traced).
12. 5.0	What a beastly image. (Interval for optical adjustments.)
12.10.0	I suppose that'll have to do. (Interval for coupling up and for cleaning and inserting plugs, which, as usual, are all over the place. He touches the key. The spot vanishes.)
12.15.0	Which way did that "dammed spot" go? (The spot returns slowly, curtsying and curvetting wildly. He waits patiently while it recovers its balance; meanwhile)— I wonder whether deflection to right means plug or unplug?
12.20.0	(Procedure as before, accompanied by increasingly picturesque language.)
12.25.0	(A balance having been obtained) How much is that unplugged? Two and four, and thirty, and ten and a hundred and two hundred and two thousands and four thousand—oh why can't one add with a slide rule? (Puts it all down on a piece of paper and adds it up—wrongly, of course.)
12.27.0	Discovers mistake. Final meditation——
12.27.5	**** * (unprintable)

### While using Evershed's Bridge-Megger

TIME. h m s.	
12. 0.0	(Couples up.)
12. 0.20	(Starts turning handle.)
12. 0.21	<div style="text-align: center;"> </div>
12. 0.22	(Turns thousands, hundreds, tens and units switches.)
12. 0.30	<div style="text-align: center;"> </div>
12. 0.31	(Turns generator handle at full speed.)
12. 0.35	<div style="text-align: center;"> </div>
12. 0.36	Reads off—
	<div style="display: flex; justify-content: center; gap: 10px;"> <span>⑥</span> <span>③</span> <span>④</span> <span>⑥</span> </div> ohms.

RESULT IN LESS THAN A MINUTE.

**No Time for Meditation.**

LARGE STOCK IN TORONTO.

**Vandeleur & Nichols** - **5 Dineen Building, Toronto**  
Sole Canadian Agents for **EVERSHED & VIGNOLES, Limited, London, Eng.**

# ANNOUNCEMENT

WE NOW HAVE A LARGE STOCK OF THE CELEBRATED AND RELIABLE

## “Kolloid-Wolfram”

REGISTERED TRADE MARK

## Tungsten Lamps

THE ONLY GENUINE ORIGINAL METALLIC FILAMENT LAMP

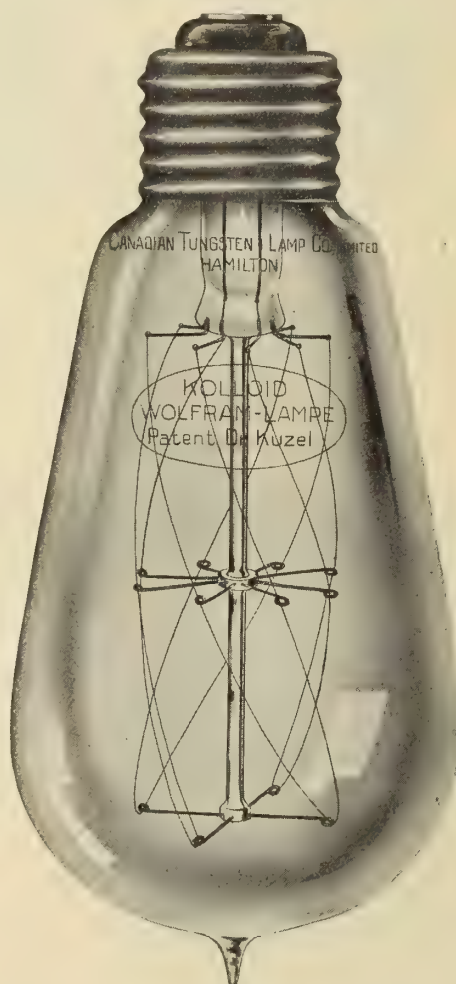
Vast improvements have recently been made in the construction and lasting qualities of our lamps, and to-day they are considered positively the height of perfection in Tungsten Lamps.

Whitest  
Light

Highest  
Efficiency

Wattage  
1.1 per  
candle power

Saves  
75%  
Current



Average  
Life  
1000  
Hours

Burns  
Any  
Angle

Alternating  
or Direct  
Current

10 and 16 Candle Power, 25 Volts.

16, 20, 25, 32, 40, 50, 75, 100 Candle Power, 110, 115, 120 Volts

32, 50, 75, 100 Candle Power, 225, 250 Volts.

WRITE FOR PRICES

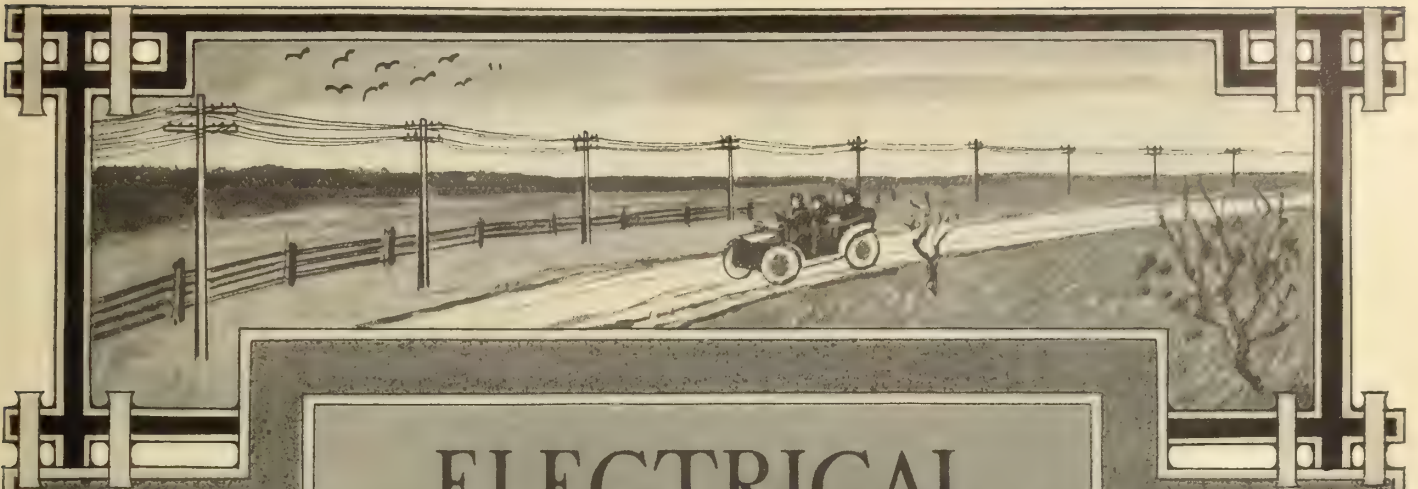
Manufactured and Sold only by

# The Canadian Tungsten Lamp Co., Limited

Hamilton - Ontario

Operating the ONTARIO LANTERN & LAMP CO., Limited



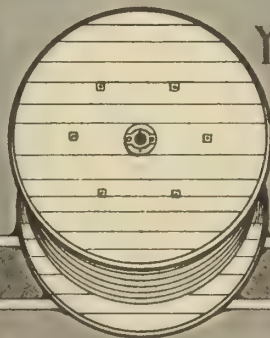


# ELECTRICAL WIRES AND CABLES FOR ALL PURPOSES

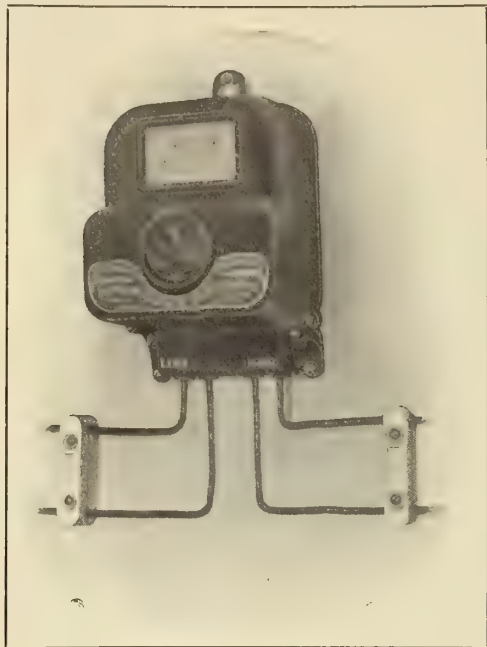
Power Cables, Lead Covered Cables  
Paper and Rubber Insulated Cables  
Rubber Covered Wire  
Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
Switchboard Cords, Telephone Cords  
Etc, Etc, Etc.

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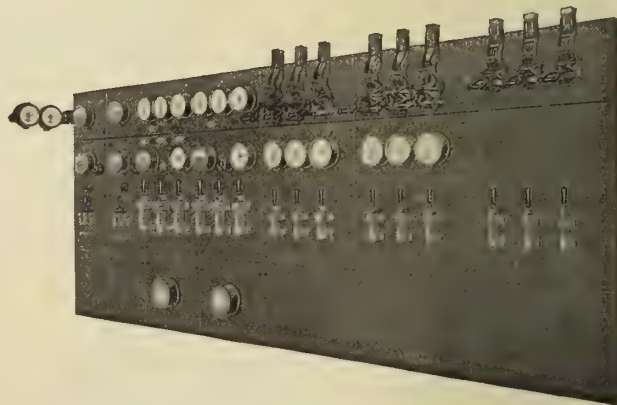
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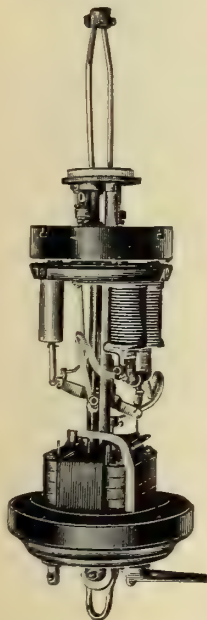
We do not buy the boxes or cabinets or receivers or generators; we make them all—from start to finish, and that we make them right is evidenced by the way Kellogg apparatus serves—in the severe daily—monthly—yearly operation in every class and size of exchange. In succeeding issues we will show views of our telephone and switchboard woodworking processes—the careful steps that combine to make the apparatus that the name Kellogg stamps as the independent standard throughout the world.

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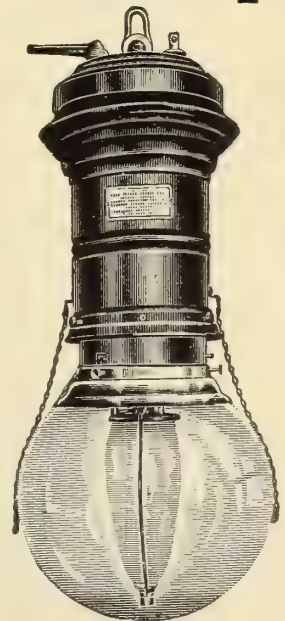
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Talk No. 3



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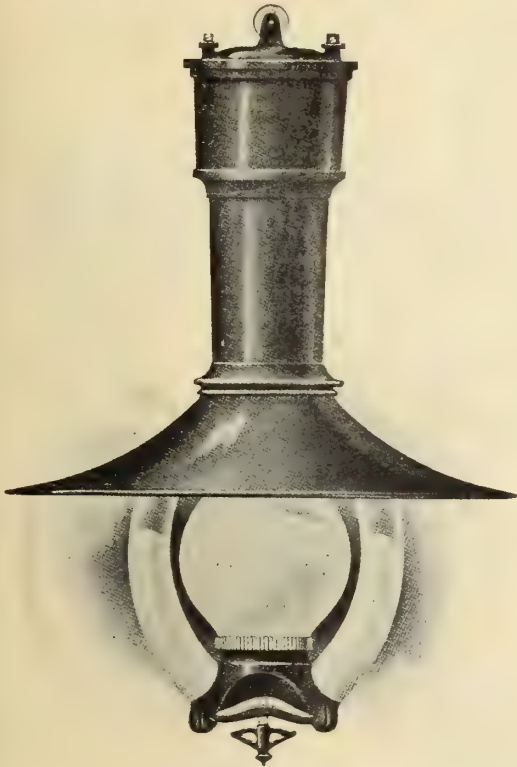
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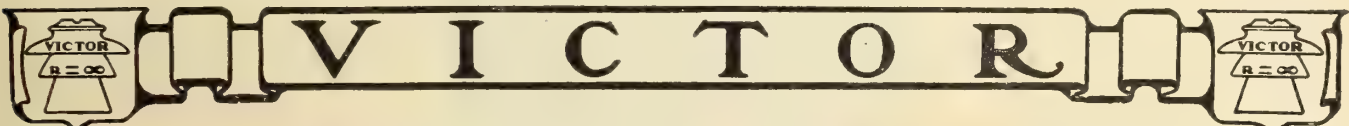
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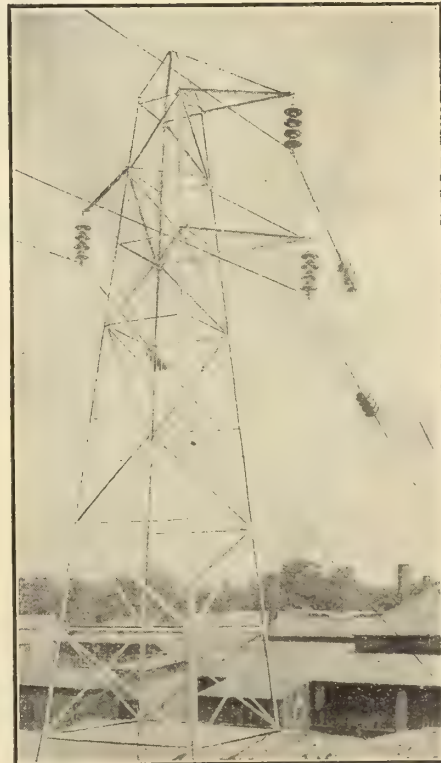
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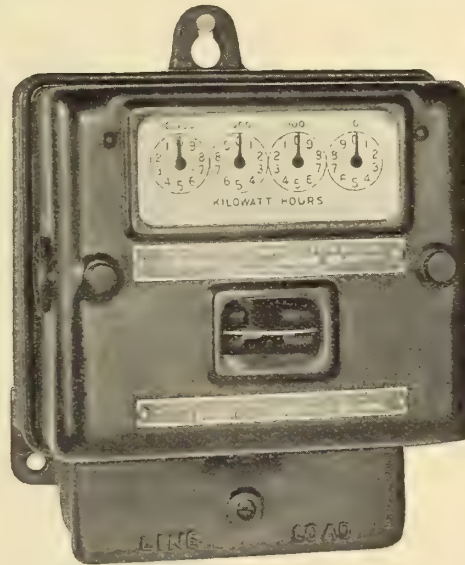
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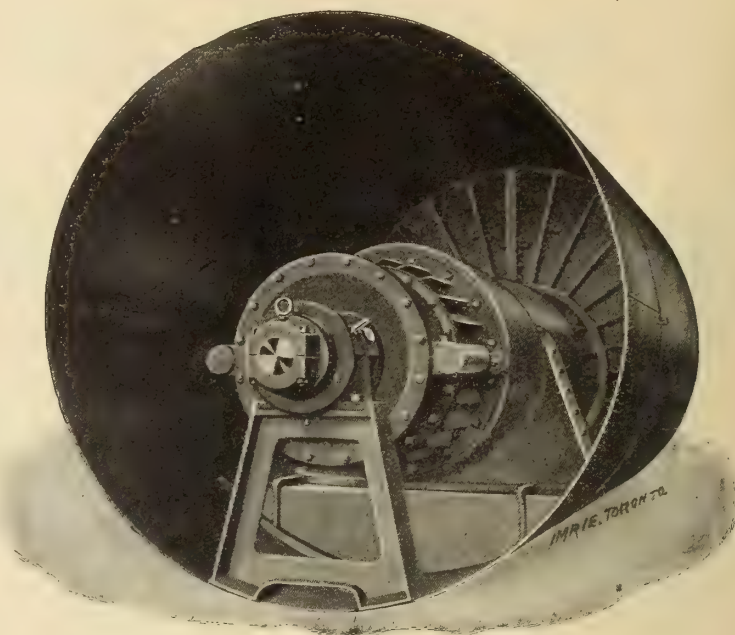
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# Canadian Electrical News & Engineering Journal

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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 8

Toronto, September, 1909

No. 9

## Telephone Convention

The programme arranged for the third annual convention of the Canadian Independent Telephone Association is announced elsewhere in this issue and bespeaks an interesting session for the men of the telephone realm. The Association meets in Toronto on September 8th, and such well-known telephone men as Dr. J. F. Demers, Dr. Doan, Mr. F. Dagger, and others will contribute to various topics of momentous interest to the future policy of independent telephony.

The Canadian Independent Telephone Association is not long-existent. Its plans as yet cannot be thoroughly matured. Laws must be formulated and regulations adopted for the furtherment of a movement which itself is but of recent introduction to this country. These must be earnestly considered at the coming convention if the independent telephone is to assume its proper standing in the community.

This Canadian society numbers in its fold men from all over our wide Dominion, men who since the inception of the Association have devoted their time ungrudgingly to a furtherment of independent telephony. As a fruit of their efforts an organization has resulted which

considering the short space of time consumed, is gratifying beyond measure and which is a pleasing forerunner of the ultimate results to be obtained.

The growth of the independent telephone in Canada has been rapid during the past few years, and there is no reason to suppose from the present outlook that the future does not hold brighter prospects still. For the independent movement naturally holds a strong grasp upon a favorable public opinion the world over. In Canada, it is true, we have not deeply felt a telephone monopoly and the independent telephone was welcomed more because it provided a safe guard from such an occurrence, but the advent of the independent into the United States was popularly heralded as a relief from a long suffered monopoly. No greater evidence of its solid position can be given than that during the recent financial distress, all the American independent companies did not suffer a diminished business.

The future of the Canadian movement is bright, but it must be borne in mind that this future rests largely in the hands of the Association. The resultant impetus that will accrue from a good convention cannot be over-estimated.

## The Winnipeg Electrolysis Situation

Professor Herdt's report to the City of Winnipeg on their electrolysis problem shows to what an amazing extent the deterioration of the underground water mains and telephone cables has been compassed by the stray currents of the Winnipeg railway system. The electrolytic action, while not plainly visible in all cases, has affected the entire central section of the city. While it is partially due to poor bonding of the rail joints which are asked to carry the heavy return currents, it seems evident that the company's present limited system of distribution, taxing as it does the rails beyond saturation, is to a large measure equally responsible.

Such a condition of affairs is remarkable and deplorable. Just now public gaze is focused upon all privately operated corporations, and it is a surety that the Winnipeg Electric Railway Company will be called to account for the damage for which they are directly, even if unwittingly to blame. It is evident that the company if they are to maintain a favorable sentiment must immediately take steps to remedy the existing conditions—their tracks must be re-bonded—substations must be erected at different points in order that the rails in the centre of the city may be asked to return only a reasonable amount of current—special bonding and cross-bonding must be employed at inter-sections, and a system of inspection of track returns must be introduced. Already the company have shown an inclination to make amends by the introduction of an electric brazing outfit, but the seriousness of the situation will not allow for half measures in the very interests of the company itself. Will they have the courage to make the radical improvements the occasion calls for?



# The Western Crop and its Great Import to the East

**Conservative Estimate of Total Grain Yield:—  
295,841,734 Bushels, Valued at \$157,293,100**

One hundred and fifty-seven millions of money! That is the very least that the 1909 crop will mean to the people of Western Canada. It is the conservative estimate of a conservative institution. In the light of past experience we would be inclined to add ten per cent. to this estimate, but taking this as a safe basis for calculation, it is easily found that this amount will provide the West with \$157 per capita, a distribution surely unique in the history of all agricultural countries.

The "Last Great West" is harvesting one of the best crops on record. General market conditions are such as to insure exceptionally good prices. There is no doubt, nothing open to question, about this crop. It is assured. The period of danger, the first half of August, has passed, and that which earlier in the season optimists dreamed of, pessimists derided, shrewd men banked on and all longed for, is no longer a shadowy possibility born of a fertile imagination, but a great, big Reality.

This being so, it behooves us in our own interests to look into the situation a little more closely, and to ask ourselves what this grain yield means to each one of us. In the first place it will enable the farmer to discharge his obligations to the storekeeper. Similarly, it will benefit the latter, who will settle up with the wholesaler. Then it will provide a surplus for the farmer, who will invest in new implements and machinery—keeping Eastern factories well supplied with orders—and for the storekeeper, who will either put another storey on his old place or pull down his wooden structure and erect a modern brick building. Better credit will be obtainable, and Eastern manufacturers who carry Western merchants will be enabled to extend their business.

An exceptionally good crop opens up a demand for increased transportation facilities—and the railways carry constructive materials of Eastern make as well as grain of Western growth. This demand in former years has resulted in railway development hitherto unparalleled in history. The railway companies are always among the first to grasp the situation and their opportunities. They have already entered upon an important schedule of extensions in anticipation of an exceptionally heavy Western movement. Another noteworthy feature will be a marked increase in import business, due to heavier buying by manufacturers in anticipation of a big demand after the harvest.

The high prices of all classes of grain are the forerunner of a very rapid marketing of Western products. A natural result of this movement will be that money will circulate far more quickly. This will be beneficial to all classes: to the farmer, to the storekeeper, to the wholesaler, to the manufacturer and to those interested in constructional enterprise. The consensus of opinion in banking circles is that the present season will be an exceptionally early one, establishing new levels in financial transactions.

It is an old prophecy that Canada is destined to become the granary of the world, and its fulfilment is being worked out to a glorious consummation. This is no optimistic effusion. The plain stubborn facts are here

to prove it. A quarter of a century ago the Canadian West had only one million bushels of wheat for export. Last year it had one hundred millions odd. In some quarters it is estimated that in ten years' time the figure will reach 500,000,000 bushels.

It is singular that the greatest conservatism is to be found in our own midst. Perhaps we are *too* conservative; anyway we are not sufficiently enthusiastic, and certainly there is not the amount of practical confidence that is warranted, especially in the East. It takes the people across the border line to enthuse over Canada, and they are not afraid of doing so to their own disadvantage. Here is an extract from the Wall Street Journal which provides a good illustration in point:

"Kansas grows but 12 bushels of wheat to the acre. Alberta had an average winter wheat production of 33 bushels to the acre last fall, and in the Canadian West

there are 200,000,000 acres of virgin soil wheat lands. Alberta and British Columbia possess the greatest quantity of coal in the world, outside, perhaps, of Pennsylvania, and its adjoining States. British Columbia possesses lumber resources greater than all the States of the Union east of the Rocky Mountains. British Columbia is, moreover, now recognized as the orchard of the Empire. The Canadian West is now drawing 100,000 of the best farm population of the United States away to the virgin lands to the north. That country is being developed, and be it remembered that the climate of Alberta and Saskatchewan is the climate of Germany, and that Edmonton and Berlin have the same climate and latitude. The Mackenzie valley will grow finer wheat

## GRAIN YIELD OF THREE PROVINCES ESTIMATED WORTH \$157,293,099.88.

The head office of the Canadian Bank of Commerce has received an estimate of the crops of the three western provinces, based upon reports from 390 branches and correspondents. The report says:

Allowing reasonable percentages for further depreciation and damage to the crop from various causes, such as rain, heat, hail, etc., we estimate the total yield for the three western provinces in wheat, oats and barley, as follows:

Wheat .....	bush.	113,979,336
Oats .....	bush.	157,537,750
Barley .....	bush.	24,324,648

The above figures have been compiled after carefully considering special reports from 390 branches and correspondents.

Taking the prevailing prices as a basis, we estimate the value of the above produce to the farmer about as follows:

	Bushels.	At.	Total Amount.
Wheat ...	113,979,336	88c	\$100,301,815.68
Oats ....	157,537,750	30c	47,261,325.00
Barley ...	24,324,648	40c	9,729,859.20
			<b>\$157,293,099.88</b>



and more of it than the Missouri valley or the Arkansas, just as the valley of the Neva will grow it, and for like causes. However unpleasant these facts may be to the people of the States, it is folly to blind one's self to the fact that the Canadian West is destined to supply beef and pork, and cheese and butter, and bread to the world. It has the soil, the climate, and the cheap transportation, and it will have the people."

These considerations should prove palatable food for reflection for all, but particularly for the East, for whom the lessons of the greatest significance are to be found.

We have now entered upon the second year of recovery from financial depression and there should be in appreciable evidence a practical show of augmented purchasing power. The great bounds of the West towards prosperity must result in the rapid extension of Eastern Canada. This is a matter of precedent. Be it remembered that financiers the world over are watching us, and we may rest assured that according as we play our part now in developing the resources of the country, so, in due course, we shall be rewarded in terms of capital and advancement.

## New Schedule of Meter Verification Fees

Electrical Standards Laboratory,  
Ottawa, August 4th, 1909.

Editor CANADIAN ELECTRICAL NEWS.

Dear Sir,—Referring to your August edition and the "New Schedule of Meter Verification Fees" published on page 19 thereof: To the general reader this schedule, coming as it does, immediately after the laboratory tariff of fees for testing electrical instruments, might be supposed to apply to electric meters. Such is not the case, however. The schedule in question is a portion of the new tariff for the verification of gas meters.

Might I suggest that, in order to make the subject perfectly clear to your readers, both schedules be published "in extenso." They are as follows:—

### SCHEDULE OF FEES FOR THE VERIFICATION OF ELECTRICITY METERS.

#### "CLASS 1.—METERS WITHOUT SHUNT COILS.

Up to 25 amperes capacity	\$1.00
Over 25 amperes capacity and not exceeding 50	1.50
Over 50 amperes capacity and not exceeding 100	2.00

#### CLASS 2.—METERS WITH SHUNT COILS FOR PRESSURES OF 250 VOLTS AND UNDER:

Up to 1,500 watts capacity	\$0.75
Over 1,500 watts capacity and not exceeding 2,500	1.50
Over 2,500 watts capacity and not exceeding 5,000	2.00
Over 5,000 watts capacity and not exceeding 10,000	3.00
For every additional 1,000 watts or fraction thereof	.25

#### CLASS 3.—METERS WITH SHUNT COILS FOR PRESSURES FROM 250 TO 600 VOLTS:

Up to 10 kilowatts capacity	\$2.00
For every additional 10 kilowatts or fraction thereof	.50

#### CLASS 4.—Meters for multiple or polyphase circuits will be charged for according to the number of circuits and in accordance with the fees defined for the class to which said meters belong.

#### CLASS 5.—INTERIM TESTS (OTHER THAN THE REGULAR PERIODICAL INSPECTIONS):

For meters of any capacity in Classes 1 and 2 \$ .50  
The interim test tariff will not apply to meters in Class 3.

The full or regular periodical inspection tariff will apply to all disputed meters tested under the provisions of Section 23 of the Electricity Inspection Act."

### SCHEDULE OF FEES FOR THE VERIFICATION OF GAS METERS.

5 lights and under	\$0.75
Over 5 lights and not exceeding 20	1.00
Over 20 lights and not exceeding 40	2.00
Over 40 lights and not exceeding 60	3.00
Over 60 lights and not exceeding 80	4.00
Over 80 lights and not exceeding 100	5.00
and for every addition 20 lights or fraction thereof	0.50

Fees to be charged for the verification of meters especially designed for natural gas:—

Nos. 0 and 1 iron meter	\$1.00
Nos. 0 and 2 iron meter	1.50
Nos. 0 and 3 iron meter	2.00
For each additional number	0.50

The fee for testing each proportional Flow-meter, the owner to make the necessary connections, pay freight charges on testing apparatus and travelling expenses of the Inspector 10.00  
For each requisition for meter inspection with notice to the opposite party 0.25

To central station managers the classification of electricity meters must be perfectly clear and self-evident, needing little or no explanation. It may be briefly pointed out, however, that class 1, includes all ampere-hour meters, such for instance as the old Shallenberger; all electrolytic current meters such as the Bastian, in fact all current meters without potential coils.

Class 2 includes all wattmeters having potential coils for 250 volts and under and embraces ninety per cent. of all the meters in use.

Meters used in connection with current transformers should be rated by the manufacturer in accordance with the actual volts and amperes applied to the meter, and should not include the rating of the transformer. The question of verifying the ratios of transformers is at present engaging the attention of the department. It is quite probable that such transformers will be tested under a separate schedule to be prepared after consultation with the manufacturers.

ORMOND HIGMAN,  
Chief Electrical Engineer.

An electric dynamite thawer is in successful use at the Roosevelt drainage tunnel in Colorado. The powder house is equipped with large electric heaters which raise the temperature of the room to 80 degrees in half an hour at a cost of ten cents daily for electric current.



# Electrolysis of Winnipeg Underground Systems

**Professor Louis A. Herdt's Thorough Investigation of an Interesting Problem.—Suggestions for Improving the Existing Conditions**

Pursuant to the resolution of the Council of the City of Winnipeg, which appointed me under date of January 5, 1909, to report upon the electrical conditions in the City of Winnipeg, particularly in connection with return current of the Winnipeg Electric Railway Company's system and their connection with the Government Telephone Cable System, and the electrical conditions existing in the city from a fire standpoint and to submit recommendations dealing with improvements of the present system so that any electrolysis or fire risk, if such exists, may be eliminated, I have the honor to present herewith the following report:

The Winnipeg Electric Railway Company, in operating their street railway system, use the rails as a return for the current operating the cars. In order to make the rails a continuous conductor and thus secure a good return path for the current, the rails are bonded at the rail joints with copper bonds, besides this the rails are connected to the station negative bus bars by return copper feeders, bonded to the track at different points of the system.

This is the usual method of street railway return construction, but electric railway companies using this system, that is, using the rails as the return circuit for the returning currents, are a serious menace to piping and cable systems in proximity to the tracks, if the methods of constructing the above described rail returns are such that the railway companies are unable to control their own currents, but use the piping and lead-covered cables as part of their return circuit.

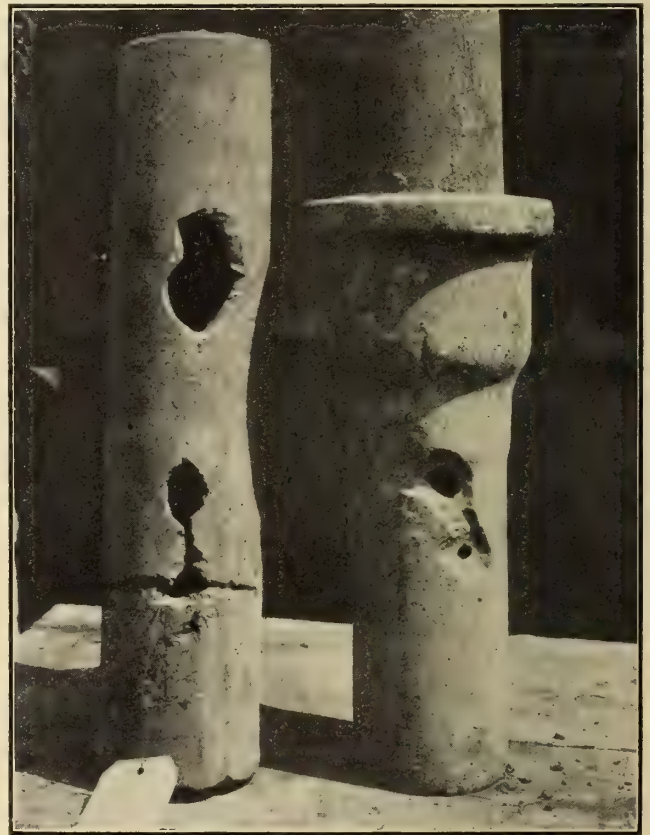
## CAUSES OF ELECTROLYSIS.

Currents from the railway system, if the track returns are in bad condition, having to find their way back to the power house, will flow from the rails which are in contact with the ground, through the ground and such metallic constructions in it as offer the least resistance to the flow, and after flowing through these (gas pipes, water mains, lead-covered cables, etc.) towards the station, will return through the ground, back to the rails to return conductors in the vicinity of the power house. These stray currents cause electrolytic action, that is, wherever current passes from a pipe or cable to ground, or to another pipe or cable, corrosion of the metal is set up; holes and pittings are produced, causing bursting and leaking of pipes, eating away of the lead-covering on telephone and other cables, rendering them useless. This corrosion may be very rapid and depends on the intensity of the stray currents passing through.

If the rails in a track system were continuous and the current density in the rails kept low, with rails well connected to the power house, the rails would offer such a good return path for the current that street piping, cables and other metallic structures would be practically immune from electrolytic damage due to stray currents. However, as the rails are not continuous but made up in lengths, they must be jointed by copper bonds possessing such mechanical and electrical properties as will secure permanent and efficient electrical continuity of the rails between sections. If such bonding does not exist, and if return feeders connecting the rails to the power house are inadequate for the purpose, the amount of leakage current must be great and elec-

trolysis is bound to exist. The immunity of street piping and other metallic structure from electrolytic damage due to stray currents demands that electric railway companies adopt such method of construction for their track returns as will minimize the danger and the railway companies must maintain the efficiency of such construction through systematic inspection and repair.

In view of the above and in order to arrive at correct and definite conclusions regarding the conditions existing in the City of Winnipeg, a survey for electrolysis and examination of the track piping and cable systems was made showing electric railway tracks, high pressure water mains, domestic mains, gas mains, telephone cables (close to or paralleling railway tracks), also present lay out of feeders and sections—electric rail-



**A Striking Example of Electrolytic Action on a Water Pipe and Lead Cable at Winnipeg.**

way tracks, weight of rails, return feeders, bonds, and also showing localities where damage to water pipes by electrolysis has taken place (from reports of F. A. Cambridge, Esq., city electrician).

## THE WINNIPEG RAILWAY'S SYSTEM.

The Winnipeg Street Railway Company have two plants in the City of Winnipeg—one, the old steam plant at the foot of Main street, corner of Assiniboine avenue; the other, the sub-station on Mill street. The first plant is kept as a steam reserve; the second plant, which furnishes the whole of the electric current for the street railway system, receives its electrical energy from the hydro-electric plant at Pinawa Channel of the



Winnipeg River. The average current for the railway service fed out from this plant approximates 6,000 amperes, but reaches as high as 9,000 amperes at times of heavy load in the winter months.

The street railway tracks are bonded at the corner of Main street and Portage avenue to return feeders connected to the negative bus bars at the station. Other return feeders connected at different points to the track are also used.

It was apprehended at once from a study of the geographical location of the power station, its distance from the street railway tracks, the large volume of current that required to be returned to it, the run of the underground piping system and the telephone cables and the proximity of the river, that unless the track returns were of the very best, and unless there was a very generous amount of copper used for the negative feeders, the conditions were such as to point to great possibilities for stray currents.

#### ELECTROLYSIS INVESTIGATION AND SURVEY.

The electrolysis survey which was carried out, involved not only mere readings of potential difference between the rails, the piping system and telephone cables, but it embraced an examination of the feeding circuits, the general condition of the roadbed and the size and efficiency of the return. A complete and thorough examination of the points where the city electrician had reported damage to the pipes was also made.

The following summary states concisely the conditions existing in the city.

#### AFFECTS OF STRAY CURRENTS.

The report of your city electrician, giving location of pipes damaged dating from January, 1905, to June 4, 1909, shows the districts in which electrolytic action has mainly taken place, and the pieces of water pipe and lead-covered cables taken from these districts by Mr. Cambridge were examined and showed without doubt that holes and breaks in them had been caused by electrolytic action.

The damage reported in these districts is caused by the very bad condition of the bonding on Portage, Notre Dame and William avenue and Sherbrooke street tracks. On Portage avenue, from Hargrave street towards Sherbrooke, where the roadbed is unpaved, the bond wires, which are Nos. O, B, and S, soft copper wire with bonding cap terminal, give readings in equivalent feet of rail of 20 to 60 feet—this shows very bad condition of bonding.

At several places the bonds are uncovered and many broken bonds were noticed. Current is leaving the tracks in Sherbrooke street, South Portage and Notre Dame west of Sherbrooke (rails are positive to pipes), entering the pipes, flowing down these until close to Main street is reached (along Main street from river to C. P. R. subway, pipes are positive to rails), the current leaves the pipes to rails, telephone cables on other pipes causing the damage reported—it accounts also for the trouble reported in the T. Eaton Company's store. (Report of city engineer, March 2, 1909.)

In connection with the district around the car barns on Main street close to the river, the rails on Main street are bonded to the water pipes. The heavy water mains on this street carry a large part of the railway current till it reaches Water street, Notre Dame avenue and Portage avenue east, the stray currents are here given back to the telephone cables which are bonded to the negative bus bars of the sub-station on Mill

street and also to the intricate network of mains and service pipes lying in this district. This accounts for the trouble reported in the McIntyre Block. In this connection, the writer desires to state that on May 26 in company with the city electrician this building was visited. In the basement a recording amperemeter was connected between the water main and the telephone cable. Charts of current readings were kept. At the time of the visit 50 amperes were recorded and the water pipes was positive to the telephone cables. With the statement reported by your city electrician that such a condition involves danger of fire, the writer does not agree, although the conditions there are remarkable enough that conditions might be assumed under which fire could be possible. The remedial scheme referred to above, that of bonding the tracks with water and gas pipes, although it may afford local protection and was considered good practice some time ago, will



Showing the Gradual But Sure Destruction by Electrolysis.

greatly increase the amount of stray currents and should not be encouraged.

The bonding of the tracks on Main street from the river to the C. P. R. subway is good. In addition to the rails which are heavy (70 and 95 lbs. to the yard), a 500,000 c. m. cable runs between the rails and is cross bonded to the track. On account of the bad condition of the track returns in the other parts of the city causing stray currents everywhere, the tracts on Main street, connected to the bus bars, through heavy copper returns, draw the currents from the piping along this street. This is shown by the electrolysis survey, as readings taken along this street between the high pressure hydrants and domestic water pipes show these positive to the rails. As a matter of fact throughout the whole centre of the city this condition is met.

It can therefore be stated that electrolysis is taking place through the entire centre of the city.



## RETURN FEEDERS.

The tracks are bonded at the corner of Main street and Portage avenue to the return feeders of a total sectional area equal to 6,848,000 circular mills. The drop of potential between this point and the negative bus bars, if these carried the whole railway current would reach 12 volts at times. The distance is approximately 1,200 feet, that is, the drop of potential from these tracks to the station is one volt per 100 feet. This is altogether excessive, a voltage drop of one-half volt per 300 feet is usually considered large enough. The above condition is responsible for the trouble reported in the district from Notre Dame avenue, from Main street to the railway sub-station.

Return feeders, besides the one stated above, are also used, they are bonded to the tracks at different points of the system, but they are of comparatively small section and little current can be carried by them. To sum up it will suffice to say:

1. With the exception of Main street from the Assiniboine river to the C. P. R. subway, Portage avenue from Main street to Hargrave street, Notre Dame ave. from Main street to Charlotte, Corydon avenue from Pembina street to Lilac street, Lilac street from Corydon avenue to Woodlaw avenue, and the tracks which are being now bonded with electrically brazed bonds (i.e., Dufferin avenue and Logan avenue), the track returns of the Winnipeg street Railway Company are in very bad shape.

2. The load on the Mill street substation and its location are such that it is not possible to return through the rails and return feeders only, the large volume of current required for the street railway service.

Electrolytic troubles and damage to the piping system and cables result from these two conditions and is spread out over the whole of the centre of the city, although it has appeared only, so far, in certain districts.

## RECOMMENDATIONS.

The cure for the electrolytic trouble should come from the Electric Railway Company, as the city cannot do anything to protect its piping system from stray currents.

Remedial means are mainly those which I have already stated in my preliminary report, dated April 1, 1909, and addressed to your secretary, namely:

1. Installation of sub-stations at different points of the system—this with a view of diminishing the amount of current to be returned through the rails in the centre of the city.

2. Proper rebonding of all tracks that show defect.

3. Special bonding and cross bonding work at intersections.

4. A system of inspection of track returns by the railway company.

A sub-station system of power distribution will do away with the electrolytic trouble. At present the whole current for the railway service being fed from one station, gives rise to a concentration of current in the tracks situated in the heart of the city. The current density in the rail returns must be kept low. The soil in this city shows a very low resistance and only very small difference of potential in rail returns can be allowed. This must be assisted by a rebonding of the tracks which show defects, that is, which indicates excessive drop. All bonds showing a reading of more than 4.5, that is, whose resistance is greater than 4.5 feet of rail should receive attention and be made good. Track intersections should also receive careful atten-

tion, ground plates at sides of bridges to carry return currents from one side of river bank to the other must be done away with and insulated feeders placed instead.

## ACTION BY COMPANY.

I am pleased to state that the Winnipeg Electric Railway Company is carrying its work along these lines, following recommendations made by William B. Boyd, chief engineer, Toronto Railway Company and Toronto Power Company, Toronto, and approved by the writer, the Winnipeg Railway Company have placed order for electrical machinery, which will be installed in three new sub-stations located as follows: One sub-station near the car barns at Fort Rouge, another on the line running to the Country Club, approximately 17,000 feet from the Mill street sub-station, and the third in the north end of the city near the car barns. This will reduce very largely the amount of current returning through the rails on Main street. These rails are now very much overloaded with current.

In connection with the rebonding of the tracks, the



A Further Example of the Winnipeg Electrolysis.

railway company have now in the city, and in operation, a bonding car for electrically brazing copper bonds on the rail joints. This type of bond, carefully installed, will secure an effective system of rail return. It can be easily applied on old work with very little disturbance of pavements. Tests made on Logan avenue, where this type of bond is in place, show very low readings of voltage drop. The work being carried out now by the railway company on Dufferin avenue shows construction work of a very substantial nature and plans for special work at intersections submitted by the railway company to your city electrician and approved by the writer will give intersection with very small drop of potential.

Besides the above, the railway company have advised me through Mr. Boyd, that it is the intention of the



company to carry out the following work of reconstruction of their tracks:

1. New rails on Broadway from Main street to Osborne street.
2. New rails on River avenue from Main street to Osborne street.
3. New rails on Osborne from Assiniboine river to Spadina avenue.
4. New rails on Academy road from Wellington crescent to Stafford street.
5. New rails on Notre Dame avenue from Nena to Arlington avenue.

The Winnipeg Railway Company must be instructed to proceed with this rebonding work and with the installation of the sub-stations without delay. The rebonding of the tracks must proceed at maximum speed, night and day, until the whole system is in proper condition. After this is done, all bonding of the rails to the telephone cables and pipes should be removed, as well as the ground plates at bridges. The amount of copper in the feeder returns from Main street, corner of Portage avenue, to the sub-station, must be increased to at least 10,000,000 c. m. and the railway company should be instructed to place these wires in the ground in approved conduit.

The writer also desires to recommend that following the termination of the work above outlined, that is, some time in the fall, a survey be made to see results accomplished.

The third recommendation made, namely, that the railway company should maintain its plant in a high state of efficiency through a rigid inspection of the track returns, is of the greatest importance to the city and should be enforced. The track returns should be under test at all times, in order to remedy at once any faulty bonds as they appear.

Accurate records of the drop of potential at different points of the railway system should be kept by the railway company and be open to inspection of the city electrician.

If the above recommendations are carried out with a desire to obtain best results, troubles due to electrolysis will be practically eliminated. In conclusion, the writer desires to acknowledge his indebtedness to Mr. Boyd for his assistance in this investigation.

The electrolysis tests were carried out by Mr. Beaubien, electrical engineer, Montreal, assisted by Mr. McGinnis, of the Winnipeg electrical department.

The recent destruction by fire of the Port Morion, N.S., wireless station of the Marconi Company, besides causing a heavy loss to the company, necessitates an inconvenient loss of time to the continental press, and others who have for some time been making use of this system of transmission. Nothing remains of the plant except the boiler house and the four large towers, and one of the latter is badly damaged. A number of the duplicate parts of the mechanism are on hand, but not in sufficient quantities to place the plant in working order.

Last March the Morion station made a new world's record for wireless transmission, communication being established with the Eiffel tower at Paris, France.

The E. W. Gillett Company, King street west, Toronto, have recently leased from Death & Watson, the electric sign men, a large roof sign, situated at 446-448 Spadina avenue, reading "Magic Baking Powder." The sign is surrounded by a circular border containing ruby lamps, while the reading matter is in white. The company are well pleased with the sign.

## Torch Brackets for Street Illumination

On the head office building of the Traders Bank of Canada, at the corner of Yonge and Colborne streets, there have recently been placed six electric torch brackets, of which we give an illustration in this number. These lamps were executed by the J. L. Mott Iron Works of New York, from the designs of Mr. F. S. Baker, F.R.I.B.A., the bank's architect.

The brackets are of cast iron and weigh about 800 pounds each. They measure about 6 feet in height, and are placed about 8 feet above the sidewalk. The projection from the wall is about 3 feet. They are secured to the stone work by four three-quarter inch expansion bolts, and to prevent cutting the interior decorations the wires are brought in conduit along the lane at the side of the building, and along the top of the stone cornice, in which they are sunk and hidden from view. From this conduit a branch runs to each bracket. The brackets are fitted with four 6 inch by 12 inch and one 7 inch by 14 inch opaque glass globe, in each of which is placed a single large candle power



Lighting Brackets on the Traders Bank, Toronto.

Tungsten lamp. The lights are controlled by switches on one of the switchboards of the building. The brackets are finished drop black, and are fitted with waterproof sockets.

With the line of electric lamp groups around the top cornice of this sixteen storey building, the illumination caused by these torch brackets has a very pleasing effect and brilliantly illuminates the street. The brackets were installed by W. J. McGuire, Limited, of Toronto.

Messrs. Crossley Bros., the well known gas engine builders of Manchester, England, announce that in addition to supplying producer gas plants for utilizing bituminous coal, lignites, coke, sawdust, shavings, charcoal, etc., they have now designed a gas plant for utilizing the smoke box char which is usually taken from the smoke box of locomotives, similar material being also taken from the residue from blacksmith's hearths, and the like. This plant has not been designed simply to support a theory, but has been put to practical use, and the plant is now offered as a commercial proposition in a number of standard sizes. Messrs. Crossley's Canadian agency is conducted by Messrs. Laurie & Lamb, engineers, 212 Board of Trade Building, Montreal.



# Peculiarities in Wear of Hydraulic Turbines

Examples of Disintegration due to Mechanical and Chemical Action—A Study of Various Types of Wheels—By J. E. Dalemont

In a country, where the number of waterfalls is considerable, and the number of hydro-electrical plants is steadily on the increase, the question of the wear on turbines is highly important.

We do not here refer to the normal wear produced by the friction of the lubricated parts, but to the abnormal wear, which takes place generally in the paddles. Fig. 1 shows a remarkable example of this.

This wear is always produced rapidly, and penetrates more or less into the metal, after which it would seem to cease.

The writer recently had occasion to study this question of wear in a great number of hydro-electrical power houses in Switzerland, and noticed some interesting facts in connection with same. A few may be mentioned here. In one power house, there were two turbines working under the same height of waterfall, one of these (fig. 2) wore out in six or eight weeks while the other was intact at the end of four years.

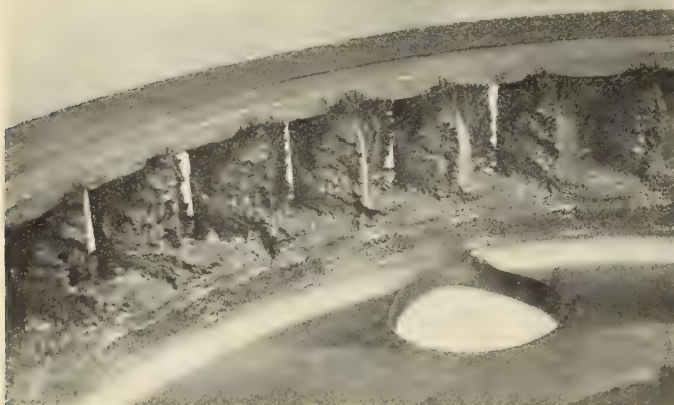


Fig. 1.—Deterioration of Turbine Paddles.

The explanation of this lies in the fact that the turbines were of a very different type, and while the first, which is illustrated, was a limit-turbine working with the total injection more or less reduced by the regulating drawer, the second, which was intact, worked with a partial injection as an action-turbine.

Moreover, the first was supplied with a suction tube, and this, as is well known, would permit of the whole fall being utilized.

In another case, we noticed on the same river, and in different plants, two action-turbines with partial injection, one of which was intact after eight years' use, while the other was greatly worn after a few months (fig. 3).

The distributor in the last mentioned turbine showed wear on one side only, and at four points, plainly visible in fig. 4, while the other side, turned towards the inlet, showed no trace of wear.

This difference was due to the fact that the liquid veins passing through the distributor, in each quarter circle, had a different direction as regards the axis of the machine. The result is that at the worn spots, the neighboring liquid veins diverge and produce at the outlet a whirl, which is the primary cause of the wear.

From the study of the subject and from the chemi-

cal and photomicrographic analysis made, we inferred that the wear may be attributed to a mechanical as well as a chemical action.

The first, that is the mechanical action, is all the

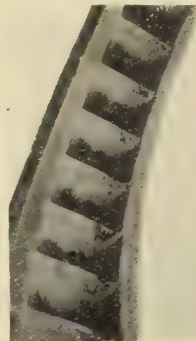


Fig. 2.—View of Limit-Turbine.

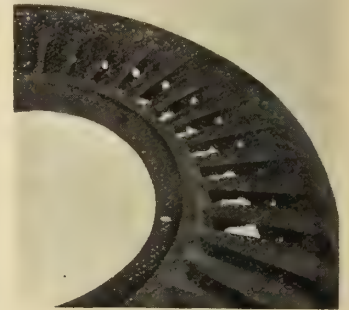


Fig. 3.—Action-Turbine Badly Worn After Short Operation.

more important in that it leads to, and introduces the other, and that it may be avoided under certain conditions. For instance, the use of a regulating drawer, which cuts the vein abruptly, causing whirls, should be avoided.

These whirls have a great influence and are very harmful, especially where the water contains sand. The latter gives to the whirl an action similar to that of a millstone in rapid rotation.

All the turbines which the author studied in Switzerland worked under waterfalls of average height (180 feet) and were of from 500 to 1,500 horse-power.

For this reason, we have confined ourselves in this article to general statements, referring the reader to a pamphlet published on this subject and giving closer details.

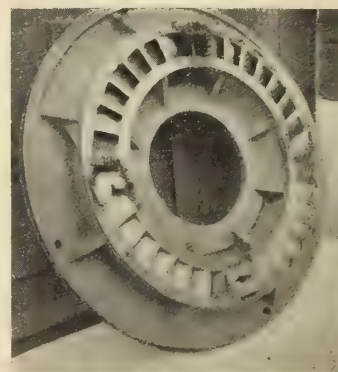
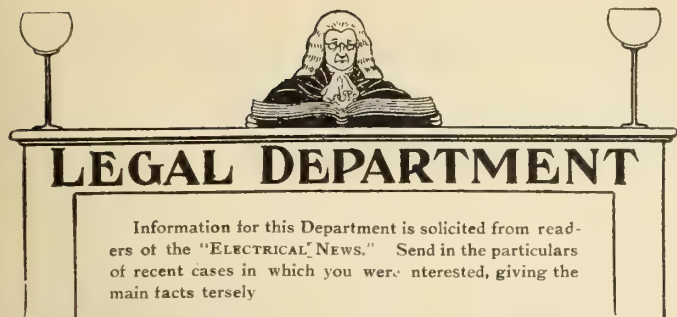


Fig. 4.—Distributor of Action Turbine Worn Only on one Side.

Professor Dalemont has devoted considerable time to a study of the question of turbine wear, and his book entitled "L'Usure Anormale des Turbines Hydrauliques" contains more detailed information bearing on this subject. If our readers have met with any instances of turbine wear, especially in the case of large turbines operating under low head, Prof. Dalemont informs us that he will be pleased to make a comparative study of them, and to publish later in the "Electrical News" the results of his investigations.—The Editor.





**East Kootenay Power and Light Company v. Cranbrook Electric Light Company.**—This case came up before the Full Court of British Columbia, Chief Justice Hunter and Justices Irving and Clement presiding, and was an appeal by the East Kootenay Company from a decision rendered by Chief Justice Wilson in favor of the Cranbrook company, which decision was in turn an appeal from the finding of the South-East Kootenay District Gold Commissioner in favor of the Kootenay company. The facts of the case are as follows:

The East Kootenay Company were holders of a water record for 25,000 inches on St. Mary's river, the point of diversion being about 4 miles above the point of diversion mentioned in the Cranbrook company's record for 5,000 inches on the same river. Neither party at the time of the first hearing had constructed any works on this river, but both parties had paid money for records and making surveys. The Cranbrook company, however, operated a plant in Cranbrook and supplied the municipality with light. The East Kootenay company having found that their point of diversion was not practical, from an engineering standpoint, sought to change the diversion to a point within 150 feet of the other company's point of diversion. Evidence was given that the dam of the East Kootenay company when built would be about 150 feet away from the Cranbrook company's proposed dam, and that such dam would interfere with the latter company's works. This was contradicted, but it was admitted that the former dam would flood the latter. The Cranbrook company had had their proposed work and undertaking approved under sec. 85 et seq. of the Water Clauses Consolidation Act, 1897, which approval covered not only a scheme for using the 5,000 inches but at least 25,000 inches more, but such approval, it was understood, should not be construed as giving the company any absolute right to such future records when applied for. The scheme as approved allowed the company to construct their power house immediately below their dam.

The East Kootenay company admitted that if they changed their point of diversion their record must be considered junior to the other company's record of 5,000 inches. The latter company, however, after the East Kootenay company's petition for a change of diversion, had applied for records of 30,000 inches in all, additional water from the same point.

The Gold Commissioner had granted the East Kootenay company the right, under sec. 27 of the Water Clauses Consolidation Act, to change the place of diversion in the grant which they had recorded. Chief Justice Wilson in allowing the appeal of the Cranbrook company against this decision said: "The Cranbrook company have a water record for 5,000 inches and a right to apply for a further record of 28,000 inches, and their undertaking to that extent is approved by the Lieutenant-Governor in council. They have made the necessary applications. The East Kootenay company, if succeeding on that point, would deprive them of all rights at the point of diversion except in so far as the

5,000 inches, which they already have, is concerned, and to that extent render the order in council nugatory."

The Full Court judges dismissed the final appeal of the East Kootenay company with costs, on the ground that the approval of the scheme, involving the utilizing of 2,500 inches more, meant serious interference to the respondents' pre-established record of 5,000 inches. The Court further added that the Lieutenant-Governor in council did not exercise a jurisdiction in conflict with the Gold Commissioner, but reserved the right to protect the public interest by approving or disapproving of the scheme of development submitted by water record holders.

### Stationary Engineers' Convention

The twentieth annual convention of the Canadian Association of Stationary Engineers, held at London, Ont., from July 27 to 30, 1909, was in many respects the best in the history of the Association. The convention was held in the City Hall, which was decorated for the occasion. The C. A. S. E. Exhibitors' Association, an organization of the different supply houses for the purpose of making exhibits at the meetings of the Association, occupied all the available floor space in the main hall. The exhibits this year were much in advance of the former year, both in the numbers and quality. Amongst the exhibitors were the Canadian Fairbanks Company, represented by Mr. Geo. E. Fisher, of London; the Goldie & McCulloch Company, Limited, with Mr. Earl Heatherington in charge; Peiler & MacKenzie, Montreal, represented by Mr. Peiler; McLeod & Henry, Troy, N.Y., Mr. A. W. Pettie, representative; Russel & Gifford; the Canadian Steam Boiler & Equipment Company, represented by Mr. Z. Hemphill; the Dunlop Tire & Rubber Company, represented by H. C. Austen; the Dart Union Company, Limited, Toronto, represented by Mr. J. B. Goff; the Diamond Grate Bar Company, Berlin, represented by Mr. Taylor; the Standard Engineering Company, Toronto; Jenkins Bros., Montreal, representatives Messrs. W. R. Stavert and H. H. Cato; the Automatic Feed & Regulator Company, London, representatives Messrs. W. R. Colby and W. H. Rice; the Philip Carey Manufacturing Company, Toronto, represented by Messrs. A. O. Cole, H. E. Rowell and A. W. Carmichael; the Lunkenheimir Company, Cincinnati, Ohio; Quaker City Rubber Company, Philadelphia, represented by Mr. T. O. Meyers; the Cling Surface Company, Buffalo; the V. D. Anderson Company, Cleveland, represented by L. H. Ramage; the Bice Automatic Regulator Company, London, and the International Correspondence School.

A valuable paper on "Uniform Construction and Inspection of Steam Boilers" was read by Mr. F. E. Leonard, of E. Leonard & Sons Company, London, during the convention.

A resolution was passed asking the Government to provide for graded certificates for engineers all over the country.

The entertainment features included a field day of sports, luncheon at the Kennel Club, where the delegates were entertained by Mr. F. E. Leonard, and the annual dinner of the association, at which 150 guests sat down.

The following is the list of officers elected for the ensuing year:—

President—C. Kelly, Chatham.  
 Vice-president—J. J. Heeg, Guelph.  
 Secretary—W. A. Crockett, Hamilton.  
 Treasurer—A. M. Wickens, Toronto.  
 Conductor—W. Norris, London.  
 Doorkeeper—W. H. Bradt, Windsor.



# Synchronous Motors for Power Factor Correction

## Reduction of Lagging Wattless Components of Induction Motors by the Counteraction of a Leading Wattless Component\*

By B. J. McCORMICK

The use of synchronous motors for power factor correction has been made the subject of so many papers that it may seem ridiculous to revive such an old subject, but within the last few years the companies manufacturing electrical apparatus in Canada have received so many inquiries for synchronous motors for driving various sorts of machinery, with a view of improving power factor, that it does not seem out of place to present a paper dealing with some of the problems which may arise in connection with power factor correction by means of synchronous motors.

All users of induction motors are, no doubt, aware of the fact that the reading of the wattmeter showing the power the motors take from the line, does not agree with the product of volts and amperes. Power factor may be defined as the factor which, multiplied by the product of volts and amperes, will give the true energy of the system. Similarly, the wattless factor may be defined as the factor, which, multiplied by the product of volts and amperes, will give the wattless component of energy. As this wattless component occupies a phase position  $90^\circ$  from the energy component, it follows that the sum of the square of the power factor and wattless factor is equal to unity, or

$$PF^2 \text{ plus } WF^2 = 1.$$

As the wattless component of an induction motor always lags behind the energy component, and the wattless component of an over-excited synchronous motor leads the energy component, it is evident that if synchronous and induction motors are operated on the same system, the wattless components may be made to neutralize one another, so that the resulting wattless current will be very small.

Figure 1 is a diagram showing the components of lagging K.V.A. at various power factors, with a constant value of true K.W.=100. The energy components are represented along the line OA and the lagging wattless components along the line AB; thus, for a power factor of .8 we have a wattless component of 75 K.V.A. of lagging current. The diagram can be

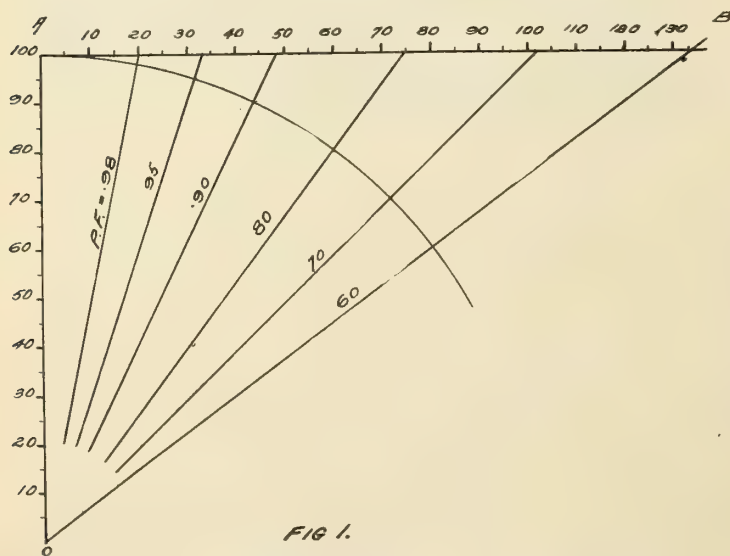


FIG. 1.  
Diagram Showing Components of Lagging K.V.A. at various Power Factors.

applied to any value of true K.W. other than 100, by taking the values in direct proportion to the true K.W.

From the diagram it will be seen that the leading current required for power factor correction becomes relatively much greater as the corrected power factor approaches unity. For instance, a power factor of .8 in order to be completely corrected to unity, requires 75 K.V.A. of leading current, while only  $75 - 20 = 55$  K.V.A. is required to correct it to a power factor of .98. The last 2% of power factor is obtained at the expense of 20 K.V.A.

From the above discussion, it is evident that it is not consistent with economy in first cost to install a motor large enough to completely correct the power factor of a system, as the last few per cent. of correction are dearly paid for in the increased K.V.A. capacity required for the motor. It is much better practice to install a motor large enough to bring the power factor to .90 or .95 when the system is fully loaded, while on light loads the capacity of the motor will be sufficient to raise the power factor still higher and perhaps completely correct it.

It is of great advantage to have the motor develop some useful mechanical energy, as this can be done with very little increase in the temperature of the motor, since any mechanical work done is represented by a watt component which combines in quadrature with the current used for power factor correction, and the resultant current is very little greater than the original

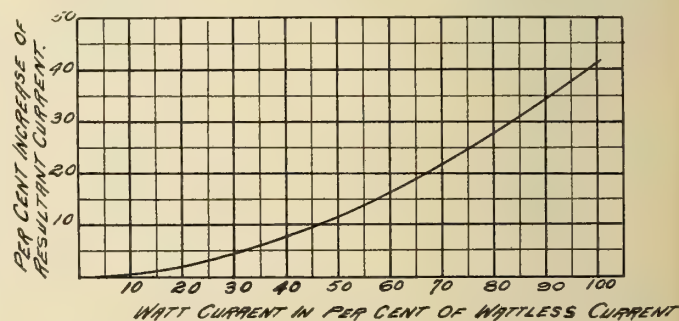


FIG. 2.

Showing Relative Values of Wattless and Resultant Currents.

current required for improving the power factor. Such a system also possesses the advantage of operating a synchronous motor at a higher power factor, resulting in a saving of power required for excitation and lower temperature on the fields of the motor, the latter being very desirable, especially in the case of high speed, 25-cycle, synchronous motors where it is difficult to keep the field temperature within reasonable limits.

Figure 2 shows the per cent. increase of K.V.A. capacity over that required for power factor correction with various values of mechanical load. The curve shows that a useful mechanical load equal to 50% of the wattless current can be obtained, while the resultant current will only be increased 12%.

The following concrete example is one which is very likely to arise and will serve best to illustrate the method of determining the proper size of synchronous motors to improve power factor. Suppose that a certain portion of the power system requires 1,000 K.W. and it is desired to divide the load between induction motors with a P.F. of .8 and synchronous motors in such a way that the synchronous motors carry 200 K.W. of useful load and raise the power factor to resultant value of .95—

800 K.V.A. of induction motor load at .8 P.F. gives

$\frac{800}{.8} = 1,000$  K.V.A. of wattless current.

Total wattless component with 1,000 K.W. at .95 P.F. gives

$\frac{1,000}{.95} = 1,053$  K.V.A.

$1,053 - 250 = 803$  K.V.A. of wattless current required of the synchronous motors to bring the resultant power factor to .95.

$\sqrt{264^2 + 803^2} = 844$  K. V. A.—total capacity required of synchronous motors.

$\frac{844}{.88} = .95$ —power factor at which synchronous motors will operate.

The problem may also be solved graphically—See Figure 4.

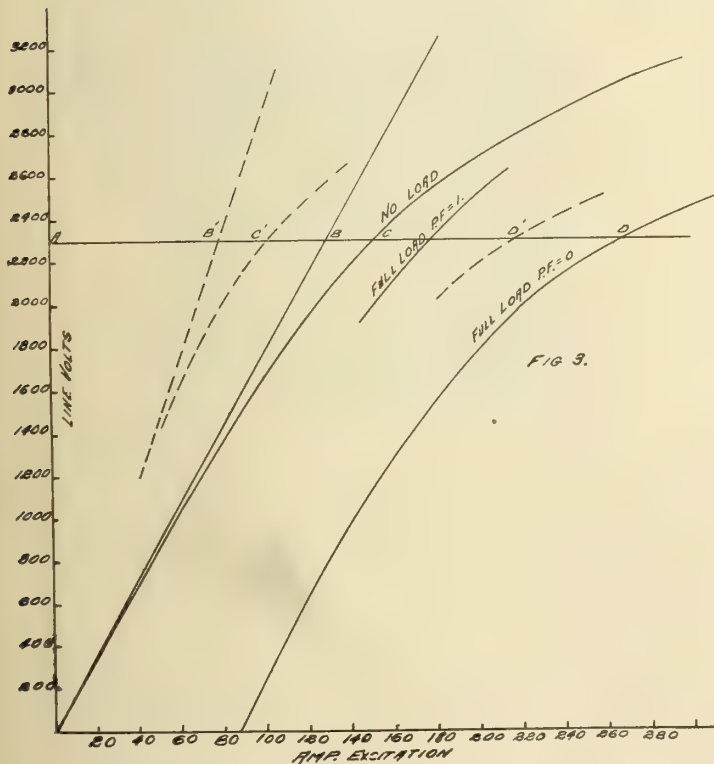
Lay off OH = to 800 K.W. of induction motor load. This we have assumed at .8 power factor, so OC must be laid off as the total K.V.A. taken by the induction motors, making the angle HOC the angle whose cosine is .8. OD is the wattless K.V.A. drawn by the induction motors. Lay off OG = to the synchronous motor load 200 K.W., and combine OG and OC, which gives the resultant OB. Draw OK making the angle AOK = the angle whose cosine is .95. The distance LB evidently represents the amount of leading current necessary to correct the



power factor to .95. Lay off  $OE=LB$ , the leading K.V.A. of the synchronous motors, and combine with  $OG$  to get  $OF$ , the total K.V.A. of the synchronous motors. Combine  $OE$  and  $OB$ , and the resultant  $OL$  is the total K.V.A. of the system.

A synchronous motor possesses the property of drawing a leading current from the line due to the fact that, neglecting the reactance, a synchronous motor at a given voltage will always operate at constant flux, regardless of the current flowing in the field windings. A constant flux also requires a constant resultant force, and any change in field excitation at the rheostat will cause a wattless current to flow in the armature, which will neutralize the change, so that the resultant exciting force will be the same as before. If the current in the exciting current is increased, a leading current will flow in the armature to counteract the change, while if the exciting current is weakened, a lagging current will flow in the armature. It therefore follows that at some certain value of field current there will be no wattless current in the armature. Under such conditions a synchronous motor will operate at unity power factor.

Figure 3 shows the saturation curve of the 2,000 K.V.A., 60-cycle, 2,300 volt, synchronous motor. The ordinates represent line voltage, while the abscissas represent the field excitation in amperes. The distance  $AB$  represents the excitation to overcome the reluctance of the air gap,  $BC$  the excitation of the iron, and  $CD$  the additional excitation necessary to make the machine operate at its full load of 2,000 K.V.A. of leading current at zero power factor. It will be noticed that a much stronger field is required for operation on zero power factor than on unity power factor, and when it is considered that the temperature of the field coils varies as the squares of the field current, it is not surprising that it is sometimes difficult to keep the fields cool. This is especially so on high speed, 25-cycle machines, where the number of poles is small. The exciting ampere turns per pole on machines of this type is so great that even when operated as an alternator on good power factors, the field temperature will be fairly high, while on zero power factor the temperature will become absolutely prohibitive. As a remedy for this, a machine with a small air gap should be used, in order to reduce the excitation to lower value



Saturation Curve of 2,000 Volt Synchronous Motor.

such as  $AD$ . Fortunately, the field construction of modern revolving field machines is such that they are not easily injured by high temperatures, and some consulting engineers make it a practice to allow  $50^\circ$  or  $55^\circ$  rise in the fields of synchronous motors operating at low power factors.

As regards suitability, it may be said that a motor with a weak armature, or in other words one with relatively few turns on the armature, is best adapted to improvement of power factor, as a motor of this type will draw a large leading current from the line for a given increase in field strength. The weaker the armature, the shorter will be the length  $CD$ , and the less

the tendency toward hot fields. This characteristic of a weak armature is one of the elements which goes to make up an alternator with good regulation, and for this reason engineers, when issuing specifications for synchronous motors, are often lead to specify a certain regulation for the motor when used as a generator. This is, however, a poor criterion, as a machine may be so designed with a strong armature and large air gap that it has a good regulation, and at the same time be unfit for use for correction of power factor, owing to the poor corrective power of the strong armature, and to a tendency to wards field heating. On the other hand, a machine may be

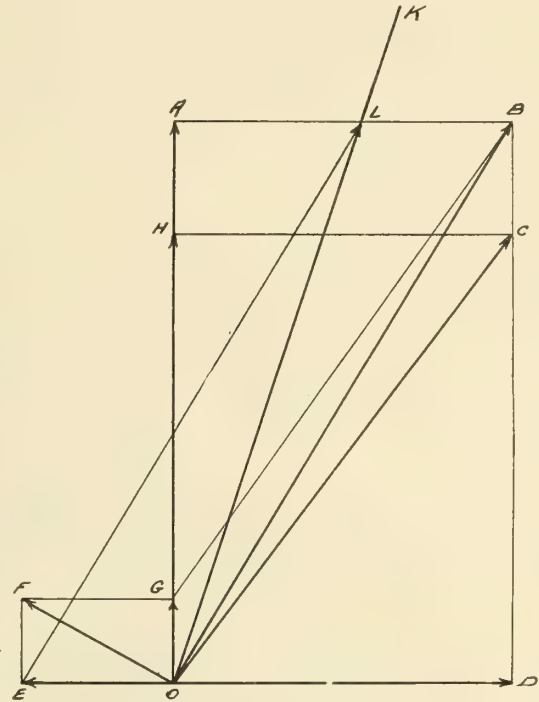


FIG 4.

Graphical Method for obtaining proper size of Synchronous Motor to improve Power Factor.

designed with a weak armature and a small air gap and be admirably suited to power factor correction, but still have a poor regulation as a generator on account of the small air gap.

#### DISCUSSION.

Introducing the discussion on Mr. McCormick's paper, Mr. Black (Toronto) said: I had occasion recently to measure the power factor on some circuits supplying indiscriminate power loads in factories and found the power factor as low as 61. Measuring the power factor at different times, it varied from 57 to about 65. This circuit supplies all kinds of factors, and it took in a large number of motors, such as would be used in the ordinary installations for industrial plants. With a power factor as low as this it shows the enormous expense for transformers and lines, more particularly if such lines have to be put underground, so that it is very essential in making contracts with any large customer some advantage should be given him if he will install a synchronous motor to keep his power factor as nearly unity as possible. The only way it seems possible to me to get the consumer to supply this necessary piece of apparatus is to do it when making the contract and rates.

President Ryerson said in part: It is also prevalent with companies to put a power factor clause in the contract allowing a power factor of, say, 90 per cent. without increase in rates, and then penalizing every power factor below 90 per cent. This is necessary, especially where your transmission system is nearly loaded.

Mr. A. L. Mudge (Toronto): This raises the question as to whether it is advisable to use synchronous motors in a certain case or not. We will suppose that the apparatus to be driven is suitable in general for synchronous motor drive, the principal requirement being that a large starting torque is not required. Consider the case, where certain apparatus has to be driven at the end of a long transmission line. In this case a synchronous motor to bring up the power factor would have a beneficial effect on the generators, on the step up and step down transformers, and on the transmission line, and would result in an increased capacity from all this apparatus. Suppose you have



the same apparatus to be driven very close to the power station with no step up or step down transformers and the line is short. In this case the beneficial effect resulting from the improved power factor applies only to the generators, and thus it might work out that at the end of a long line the use of the synchronous motor would be justified, but not if the load was located close to the power house.

The President: There are various ways of applying them for the correction of the power factor. One is in the use of the motor directly as the power producer, and the other is through a motor-generator set. Customers receiving power over an alternating circuit and requiring direct current will install a synchronous motor generator set, providing a synchronous motor larger than would be necessary to supply the direct current. One serious objection we all have to the synchronous motor, especially in the premises of our customers, is the grade of attendance necessary. It needs a higher grade attendant to operate it than the induction motor, but where we can put them in at substations where skilled attendants are required in any event, that disadvantage is obviated.

Mr. Dion: The question is similar to that of putting more copper into your lines. With more copper you have to estimate what the power is worth and what the copper will cost. In the case in point, the synchronous motor, you have to estimate the gain of capacity as against the cost of the apparatus. It is a question to be settled in each individual case on its own merits as to cost. As regards the contracts, it is difficult to explain this poor power factor question to small users. In the case of large users there is usually connected with the user some man of technical qualification who will easily understand the situation. The small user has not the benefit of that advice, and it is difficult to make him understand the thing. There is a rough way of getting at it by stating in your contract that your charges will be based on a given power factor, say 90 per cent., and if it falls below that he loses. Unfortunately, when a customer comes to you in many cases he has already purchased his motor, and the question of power factor is beyond him. But we have made that rule than in the case of flat rate the charge is to be made on volt amperes multiplied by nine-tenths.

Mr. Cole: I would like to ask as to the attitude of a large operating company supposing a customer expresses a preference to having a synchronous motor in his shop. I have heard of some companies that objected to a synchronous motor on the ground that by varying the excitation current the customer may cause trouble on the line coming from the power house to his shop, and on that account they never let their customers install synchronous motors where they (the customers) have the means at hand for monkeying with the power company's voltage regulation.

The President: For one of the large companies operating in Canada, I can say that they do not care what kind of motor the customer puts in, provided it is a good motor. They want to see him put in the best thing for his own benefit and that of the power company, and it is usual to point out to him that unless he has skilled attendants the induction motor is more satisfactory to him in the long run provided it is properly proportioned. Perhaps some other operating men can throw light on this. I think it is a mooted question amongst operating companies as to how far they can carry their supervision of customers' installations. We have all got to bear in mind that one power installation on a circuit may cause untold trouble to other innocent customers, and for that reason it is recognized that it is perfectly proper for the selling company to have some say about the installation.

Mr. Black: It is largely a question of making your contract right. If the contract is properly drawn and the consumer pays on the volt ampere basis, then you can induce him to put in a proper motor, as if he does not his power bill will be higher. So it is a question entirely of getting a proper contract on a proper basis. As between the starting of induction and synchronous motors, it seems to me the operating company should have some supervision, as a man's installing a large squirrel cage motor may do damage through taking out station circuit breakers and thereby inconvenience the other customers. Many companies adopt the rule that no induction motor of more than 50 horse-power should be allowed on any circuit as a squirrel cage motor. It is sometimes hard to enforce that rule, due to difference in cost in this country on different types of motors, but I understand that many European companies have adopted this rule.

The President: Mr. Dion raised the point that often in closing contracts the customers have already contracted for their apparatus. What I had in mind was protective apparatus, lightning arresters, circuit breakers, etc., as well as methods of installation. If we let our customers put in anything they like or that the manufacturing companies are willing to sell them we shall be in pretty serious difficulty, I am afraid.

## Multiple 25-Cycle Arc Lamps

There is a wide-spread and constantly increasing demand for a 25-cycle arc lamp, due largely to the utilization of water power in the construction of hydro-electric plants where the adoption of low frequency machines has become almost universal on account of long distance transmission. A lamp on this frequency is not entirely satisfactory for general illumination in all cases, due to the perceptible flicker, but where no other circuit is available it answers the purpose admirably. For illumination of railroad yards, factory yards, amusement parks, and in some cases, street lighting, it has been installed with satisfactory results. Engineers realize that the flicker is co-existent with the lamp, and all they demand is a design which will maintain an even arc and feed properly. The Adams-Bagnall Electric Company's 25-cycle lamp has been on the market for over a year, and from the accompanying wiring diagram the general construction can be seen.

Two parallel helical springs in place of one spring connect the clutch to the armature, and an auxiliary dash pot is so

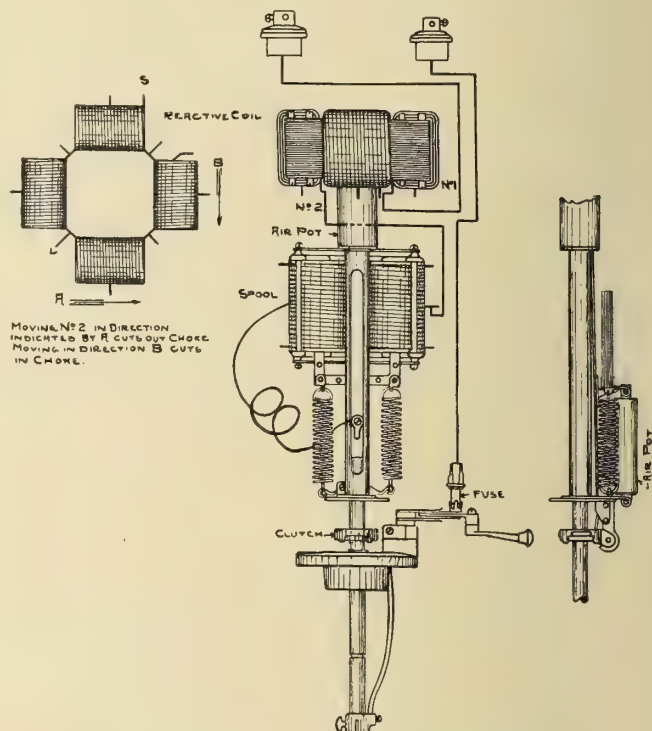


Diagram Showing the General Construction of the Adams-Bagnall 25-Cycle Lamp.

connected to the armature as to dampen the frequent and sudden movements, thereby preventing pumping. Through the medium of the springs the armature is allowed considerable range of movement and to yield to the restless condition of the current, without any visible effect on the clutch. There is no tendency of the clutch to wear into the carbon producing a rough surface, and often breaking it, with this arrangement. Cored carbons are used for both upper and lower, and the lamps should be adjusted for a little lower voltage than 60-cycle lamps, requiring 70 volts at the arc instead of 75 to 80 with a 110 volt line.

This lamp is adaptable for power circuits with extreme variations, and can be supplied for either 110 or 220 volts. All of the well-known A-B features have been retained in the construction of this lamp, and it is being installed by the leading lighting companies.

Electric radiators, both in radiant and non-luminous types, are described in a catalogue issued by Veritys, Limited, Birmingham, Eng.

The Lancashire Dynamo and Motor Company, represented by Messrs. Vandeule & Nichols, of Toronto, have recently supplied the Imperial Japanese Government with three 1,000 K. W. sets, together with the attendant controlling gear.

The new catalogue, C. 19, just issued by the Benjamin Electric Manufacturing Company, 64 York street, Toronto, is a complete encyclopedia of the different electrical lines and specialties manufactured by this firm. The catalogue is well arranged and will be a valuable guide to those interested in fixture and electrical work.



## Personal Mention

The recent removal of Mr. A. B. Lambe, from the head offices of the Canadian General Electric Company, at Toronto, to their office at Winnipeg, as manager of that district, is a distinct loss to eastern engineering circles. Mr. Lambe has been closely identified with engineering interests for almost twenty years and during that time has acquired a wide and useful experience. While Mr. Lambe's removal is sincerely regretted by a host of friends, it is a source of gratification to learn that the change is very much for his betterment, and that he will assume the management of the company's Winnipeg office, with territory extending from Fort William to Calgary and Edmonton, with a large selling staff under his control.

Mr. Lambe commenced his engineering career with his present company, entering their students' course at



Mr. A. B. Lambe—Canadian General Electric Company.

Peterborough about 1892. Graduating two years later he became superintendent of the Peterborough Street Railway, and later on was engaged with the Lima Street Railway Company, of Ohio, and also for a short time with the London, Ontario, Street Railway Company. In November, 1897, he joined the staff of the Canadian General Electric Company, and became associated with the engineering department. After five years he was appointed to the supply department as engineer in charge, and this position he has since held.

Interested in all things electrical, Mr. Lambe was particularly ardent in promoting the progress of the Canadian Electrical Association, and has been a frequent contributor to the proceedings of the society.

Big hearted, kind to a degree, he has made for himself a wide circle of friends who feel that this promotion is but the merited result of a constant loyalty to his employers, coupled with keen foresight and marked business ability. The ELECTRICAL NEWS joins his host of friends in wishing A. B., as he is familiarly known, the best the Canadian West has to offer.

Mr. F. C. Davis has been recently appointed superintendent of the electrical department for Coaticook, Que.

Mr. D. M. Saxby, of Toronto, has been appointed electrical engineer for Prince Albert, Sask. About thirty applications were received for the position.

Mr. S. L. Prenter, of Vancouver, who has been associated with the C. P. R. for twenty-four years, recently joined the staff of the British Columbia Railway Company.

Mr. H. E. M. Kensit, of Messrs. Smith, Kerry & Chace, has left Toronto and will in future reside in Calgary, Alta., where he will have charge of the firm's new office at 68 McDougall Block.

Mr. Earnest Allen, B.Sc., (Harvard), formerly Ontario representative of the Buffalo Forge Company, is now connected with the Toronto office of the Allis-Chalmers-Bullock Company.

Wm. Thornton, professor of electricity, Armstrong College, Newcastle-on-Tyne, is in Canada attending the meeting of the British Society for Advancement of Science at Winnipeg.

Mr. W. N. Dietrich, who has been for many years connected with the C. P. R. electrical department at Montreal, has resigned and will enter the consulting and contracting engineering field.

Mr. F. B. Mansbendell, of Toronto, has returned from Europe where he was engaged for several weeks in studying the latest insulation practice, in the interests of the Ontario Hydro-Electric Commission.

Howard P. Robinson, general manager of the New Brunswick Telephone Company, St. John, N.B., has accepted the position of local manager for the J. C. McIntosh & Company. Mr. Robinson's resignation will take effect about October 1st.

## Obituary

The death of Mr. A. A. Knudson, well-known consulting electrical engineer and electrolysis expert of New York, occurred unexpectedly on August 13th. Mr. Knudson at the time was engaged in investigating the electrolytic conditions at Meadville, Pa., when suddenly stricken down. It will be recalled that a few years ago he organized and conducted a very successful electrical exhibition at St. John, N.B., the first held in the Maritime Provinces. He leaves a widow and a large circle of friends in the electrical field.

## Effective Lamp Installation

An interesting installation is being made in connection with the new building of the Robert Simpson Company, Toronto, consisting of a number of flaming are lamps suspended from brackets and mounted on the top of 60-foot flag poles on the roof of the building. The lamps will be Helios, 27-hour flaming are type, fitted with spherical 18-inch globes. Although these will be 180 feet from the ground they will unquestionably produce a very vivid effect at night.

Fort William's display at the recent Winnipeg Exhibition was made very attractive by several unique photographs. These pictures, made with a special lens, were ten feet in length and three feet wide, and depicted scenes in and around the city, including Loch Lomond, the source of the city's water supply.



# TELEPHONE TOPICS

## Description of the New Brantford Automatic Exchange

By C. C. BOTHWELL.

The new automatic exchange of the Canadian Machine Telephone Company, at Brantford, Ont., was recently opened for service. A visit to this exchange reveals a most modern and ingenious telephone system. The building itself is attractively designed, is fireproof throughout and provided with richly furnished office apartments.

The toll board connecting the Brantford exchange with outside points is situated close to the entrance and is in charge of the only operator which the system requires. Off from the toll board is the main operating or exchange room. The general layout of this room and the excellent lighting facilities are particularly noticeable. On the right is the power board of Italian marble. This board is encased with chestnut strips, and the three Weston instruments are flushed with the marble, giving a pleasing appearance. The wire chief's specially designed combination desk and trouble cabinet is on the left; from here the chief has control of all troubles. He is in touch with every line and by means of lamp signals can test out each individual wire. The terminal rack occupies the opposite end of the room and at present carries 1,200 pairs of wires, each ticketed. The wires come into the exchange underground and enter the compact, fireproof terminal room in the basement, by way of six ducts of neat construction, and from there are led

to the rack. At the rack the subscriber's phone is connected to the exchange by means of a jumper, and the connection can be made very rapidly. The terminal room in the basement is provided with twelve ducts, six of which are auxiliary, thus allowing for a doubled capacity at a future date. A heat coil attached between the rack and the exchange provides a very delicate cut-out and insurance against lightning effects. The company have made their outside construction exceptionally neat. Their wires are underground on all the business thoroughfares and in all cases cable construction is used.

The subscriber's line is the usual metallic circuit and neat distribution boxes are employed.

Visiting the power room, located in the basement, before referring to the main automatic system, the 3 driving motors are encountered. These are erected on a two-foot concrete raise. Two of the motors are Westinghouse, one h.p.,

three-phase, 1,700 rev. type, and one of these is used as an auxiliary. The third machine is a 30-volt, 32 ampere, direct-current Crocker-Wheeler motor operated from storage batteries which occupy a large space at the extreme end of the basement. These batteries are charged by a 15 h.p. Allis-Chalmers-Bullock, Holtzer-Cabot motor generator set. There are 16 of these batteries and they are the ordinary chloride accumulators and were made by the Electric & Storage Battery Company, Philadelphia, and are used as a reserve power in case the local power fails. A small Holtzer-Cabot bell-ringing set, in duplicate, is also located in the basement and supplies the power for op-



George W. Lorimer.

Egbert S. Lorimer.

The Late J. Hoyt. Lorimer.

The Lorimer Brothers, inventors of the Lorimer Automatic System.



Operating Room Brantford Exchange Showing Wire Chief's Cabinet, Rack and Automatic System.

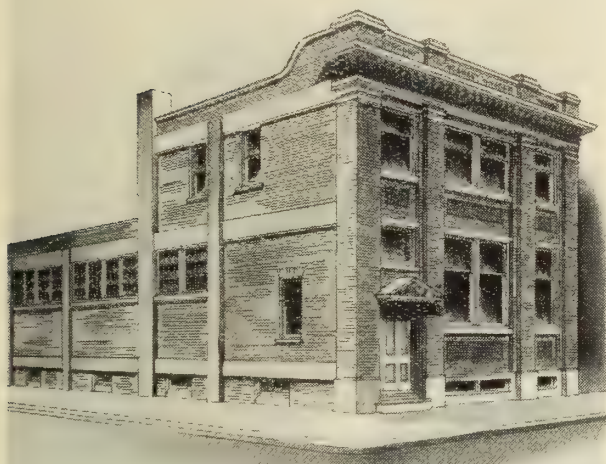


Another View of Operating Room—Powerboard on the left background.



erating the telephone bells. A small set of storage batteries is kept in reserve for their operation.

Returning to the operating room, an inspection of the automatic system is made. The system employed is known as the Lorimer, and is the invention of three Canadians, the Lorimer brothers, who have played a wonderful part in the history of telephone development. George W. Lorimer was born in 1874 at St. George, Ont., James Hoyt Lorimer two years later, and Egbert S. Lorimer in 1880. Ten years of hard work were neces-



**The New Brantford Automatic Exchange.**

sary to complete the details of this system. Mr. James Hoyt Lorimer died a few years ago, soon after the essential features were assured, but the credit for the completion of the system must be given to the surviving brothers.

The radical difference between the automatic and the manual is the operation of the latter without the requisition of a third party to make the connection. True an operator is required at the toll board of the Brantford exchange, but this girl operator merely acts as an intermediary between the city automatic subscriber and rural line. At present the city automatic subscriber is connected with 1,800 rural telephones in the Brantford district. The methods adopted to secure this automatic result are exceedingly well contrived. At first sight the system is complexity in itself, but on closer inspection it resolves itself into a multiplication of similar parts quite simple in themselves.

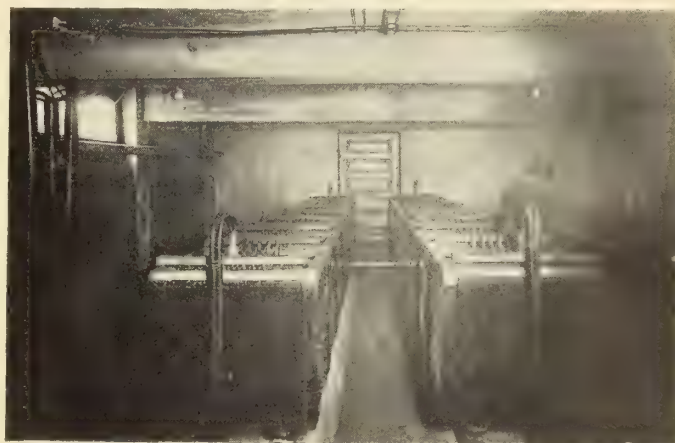
The system is made up of machines or sections to accommodate one hundred subscribers each. These sections are complete units in themselves. The position they occupy in an exchange decides which particular hundred they look after. For instance, if it is the first section in an exchange, the machine will look after from 0 to 99; if it is the fifth section in an exchange, it will simply look after numbers from 0 to 99 the same as in the first instance, but because it is the fifth section it will be the 0 to 99 represented from 400 to 499. Therefore an exchange, no matter how large it is, consists simply of a certain number of these machines or sections, each entirely alike as regards equipment, wiring and connections.

A section is made up of a decimal indicator, which occupies a place at the end of the section, and is made the same as a commutator on a dynamo consisting of one hundred segments, each segment representing a subscriber's line. An aluminium cage revolves around this commutator carrying light brushes over the segment bars. Occupying a similar position at the end of the section is the decimal indicator controller, and beneath this is the division starter.

For each sectional equipment there are connecting divisions arranged, and the number of these divisions decides the percentage of the exchange, that is the number of lines that can be connected up simultaneously or be in use at the one time. This percentage may be increased or decreased as the traffic requires by adding to or taking from the number of divisions on each section. Each division is exactly alike, doing the same thing in the same way, and correspond in one way to the cords and plugs or to the hands of the manual operator. They can handle a remarkably large amount of traffic because of the instantaneous character of the release, or clearing out, when a subscriber hangs up his receiver at the end of his conversation.

The connecting division consists of a vertical row of rotary switches, and as before stated, each division is complete in itself. Therefore should one become disabled the other divisions are not affected, but take its work up. These divisions are, moreover, used in regular order, thus evenly distributing the wear and tear. The rotary switches which make up the connecting division are cylindrical in form, and the wires representing the subscribers' lines are led to the outside contact of German silver, while a brush with a jack knife connection moves over the inside of these contacts. This revolving brush holder and cylinder switch are shown in the accompanying cuts.

The entire system, since the connecting divisions are alike, resolves itself down, so far as manufacture is concerned, to the decimal indicator, decimal indicator controller, division starter (which is really the same as the



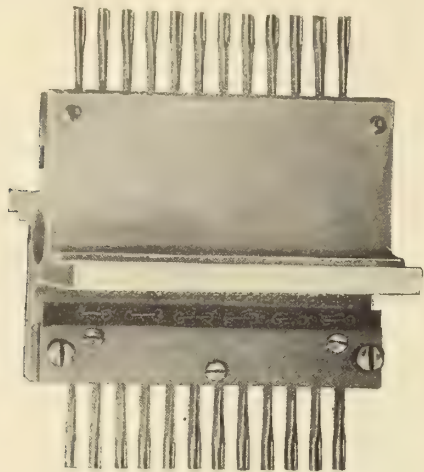
**Storage Batteries Supplying Reserve Power to the Brantford Automatic Exchange.**

switches used in the connecting divisions), and the connecting divisions. The system is, therefore, not so complicated as it appears at first sight.

Demonstration phones are placed on the walls of the Brantford exchange, and it is an easier matter to trace out the system there than it is to make it plain to the reader, but in brief the method of calling on a phone number is as follows: The subscriber, when he turns in a call at the telephone, grounds the No. 1 side of the line while the electro-magnet in the telephone is connected

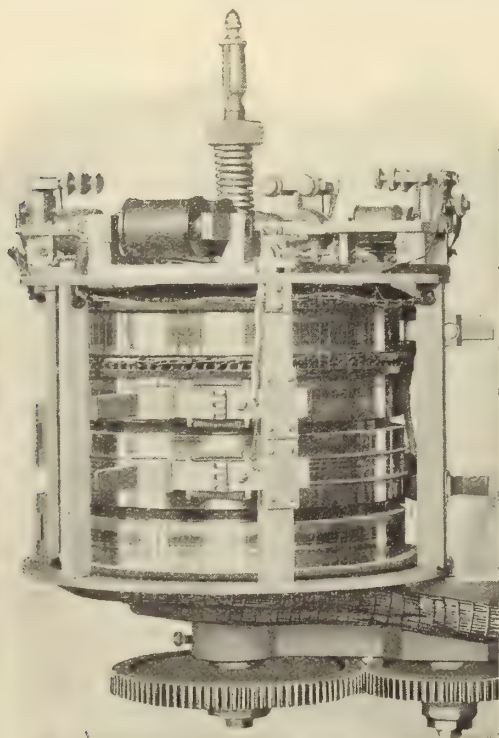


between the No. 2 side of the line and the ground. The No. 1 side of the line at central normally is connected to a bar in the lower ring of the decimal indicator and when the brush passing over the bars in that ring reaches a grounded bar the stop magnet is operated which holds the decimal indicator stationary with the brush resting



Revolving Core which fits into the Rotary Switch.

on that bar, just long enough for the decimal register controller to operate. The function of this latter apparatus is to step out a primary connector (which is the top switch in a connecting division) to the number calling, and as soon as this is done the decimal indicator is released and continues to revolve until another subscriber sends in a call. Four or five calls sent in at the



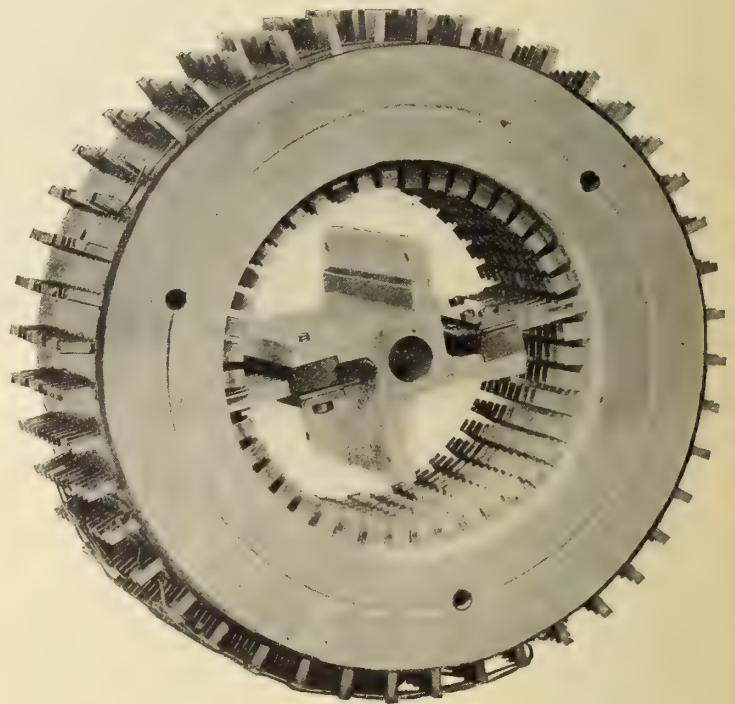
Decimal Indicator, showing Revolving Contact Brush which completes circuit every 3 seconds corresponding to operator calling one hundred subscribers every 3 seconds.

same time will be handled by the decimal indicator in their regular numerical order and will each be handled in the matter of only a second's time.

As soon as a primary connector is set in connection with the line calling the decimal indicator has nothing

further to do with the call. The whole function of the decimal indicator is to work in conjunction with the decimal register controller and set a primary connector in connection with a line calling.

After a primary connector is stepped out to the number of the line calling, the signal transmitter controller (which is the centre switch in a connecting division) operates and sends impulses out over the No. 2 side of the line operating the subscribers' telephone and causing the brush in the telephone to pass over a series of pins set in insulating material. Certain pins in this series are grounded, according to the number that has been set by the subscriber, and when the brush passes over these grounded pins an impulse is sent over the No. 1 side of the line to central, causing the corresponding number to be registered on the signal registers. When the thousands and hundreds impulses have been registered, there is a slight pause in the operation of the subscriber's instrument while a piece of apparatus, called the interconnector (which is the fourth switch on a connecting division) selects an idle secondary connector



Cylindrical Rotary Switch—Lorimer Telephone System.

(which is the second switch in the connecting division and which, as the name implies, selects the line that is called). After this has been done the subscriber's instrument completes its movement and the tens and units impulses are transmitted over the No. 1 line in the same manner as the thousands and hundreds impulses, and are registered on a secondary connector which steps out to the line called.

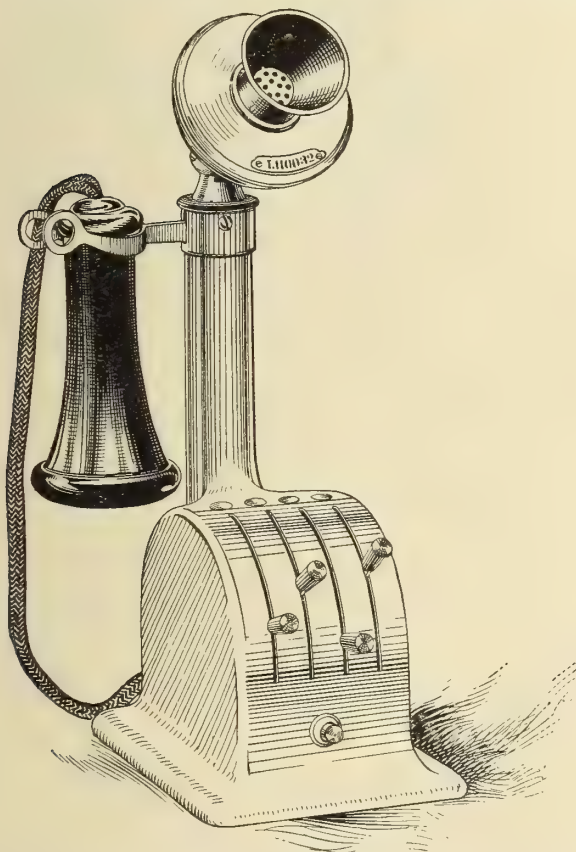
Running through the secondary and primary connectors is a guard wire for each line, and if a secondary connector stops on a busy line or one that is in use, the guard wire puts current through a relay, which prevents the connection from being made and throws a busy signal consisting of a buzzing sound, on to the calling line, but if the line called is not busy, there being no current, in the guard wire, this relay is not operated and the connection between the two lines is completed at once and conversation can be carried on. After the conversation is completed, the act of the calling subscriber hanging up his receiver causes the release impulse to be



sent over No. 1 line, which releases all the apparatus used for that connection.

There is also a time limit and alarm device on the exchange which can be set to limit a conversation to any length of time up to 12 minutes, when it is automatically cut off and the telephones released. If further conversation is desired, another call can be made. This device allows of a limited time service if such is desired in connection with pay stations or nickel-in-the-slot telephones.

The alarm device is for the purpose of giving the attendant notice of any trouble of any description, and is particularly handy at night. At the Brantford exchange the machine attendant retires regularly at ten p.m., leaving the exchange alone (a unique record in telephone operation.) If a call for any reason does not go through exactly right, this device sounds an alarm and lights a lamp on the division in trouble at the same time, so that he always knows of trouble immediately upon its occurrence, whether it be outside from an open line or lines crossed or grounded, or trouble inside with any of the apparatus, or with the subscriber's instrument. This alarm or supervisory equipment operates very efficiently and insures splendid service, in some instances locating



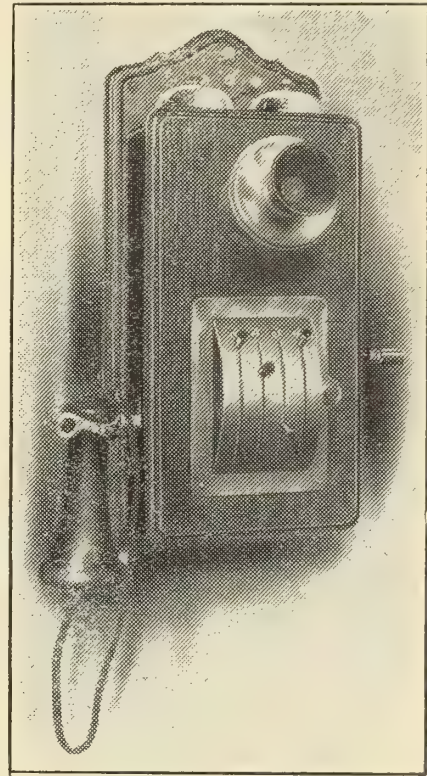
Desk Telephone used in connection with the Brantford Automatic System.

trouble before it has been brought to the knowledge of the subscriber.

The writer visited the Brantford exchange shortly after it was opened for service and at that time there were eighty subscribers connected in, according to Mr. H. E. Rose, the local manager. Perhaps the rapidity of service is the greatest feature of the automatic system. To satisfy himself, the writer watched a time test made by Mr. B. A. Lillie, the company's expert on machines, and six calls were made within the minute. From this record made in the new exchange, the statement that Mr. Lorimer has made seven calls within that self-

same space seems quite within reason. A further test of the time required to make calls on the two systems in vogue in the city did not tend to lessen the writer's faith in the Lorimer system.

From the accompanying photographs of the operating room it will be seen that the space required to take care of 1,200 subscribers is not large and that there is ample room left for expansion. A comparison of the cost of operation of the manual and automatic systems should show a balance in favor of the latter, since maintenance



Ordinary Type Subscribers Telephone.—Brantford Automatic Exchange.

costs are approximately the same, and in the case of the automatic the operation expenses are materially lessened. Another advantage to be noted is the absolute secrecy of the service and the responsibility for wrong connections, which is shifted to the subscriber and is consequently minimized. In closing, the writer wishes to acknowledge courtesies received from Mr. Mackay, manager of the Canadian Machine Telephone Company, and also from the Brantford officials, shown while obtaining this description and accompanying illustrations.

The entire telephone system of the Temiskaming & Northern Ontario Railway between North Bay and New Liskeard is being reconstructed by the commissioners of the Government road. The new system will be equipped with all modern improvements, and will be designed to provide a convenient and efficient service to the mines and the settlers of the district. In the new depot at Cobalt an up-to-date switchboard will be installed. The line will also be extended along the Kerr Lake branch to Kerr Lake station, where a switchboard will be located. The line will ultimately be extended to Cochrane, the terminus of the provincial railway.

The Manitoba Government Telephone Commission has issued a notice to the effect that in future linemen and cablemen will work ten hours per day instead of nine, as previously, with no advance in pay.



## September Telephone Convention

The third annual convention of the Canadian Independent Telephone Association will be held in the City Hall, Toronto, on Wednesday, September 8th, 1909. Dr. J. F. Demers, Levis, Quebec, is president; Dr. W. Doan, Harrietsville, Ont., vice-president, and Mr. F. Page Wilson, 226-7 Confederation Life Building, secretary.

The meeting will be called to order at 10 a.m., and after an address of welcome the annual reports will be received and then the delegates will listen to the following papers: "Independent Telephone Situation in Canada," by F. Dagger, Dr. Demers, T. R. Mayberry, M.L.A.; "Is the Telephone a Natural Monopoly?" by F. Dagger; "Good Construction"; "Proper Rates for Rural Service"; "Collections"; "Independent Telephones in Railway Stations," by C. Skinner; "Ex-



Mr. J. F. Demers, President of the Canadian Independent Telephone Association.

change Directory," by Dr. Doan; "Reasonable Toll Connection Relations"; "Good Operating"; "Forced Physical Connection."

## Some Good Contracts

Mr. George J. Beattie, 109 Victoria street, Toronto, Canadian agent for the Stromberg-Carlson Telephone Company, reports the following recent sales: A three position central energy multiple switchboard, 400 line capacity, for the T. Eaton Company, Limited, Toronto. Two hundred telephones and a one hundred and fifty line switchboard for the Brussels, Morris and Grey Telephone System, Brussels, Ont. This is, as the name implies, a municipal company covering territory in the Township of Morris and Grey, and formed under the Telephone Act of Ontario. Fifty telephones to the Mount Albert Telephone Company, Limited, Mount Albert, covering part of this season's extension work. One hundred and eighty telephones to the Tuckersmith Municipal Telephone Sytsem, Seaforth, Ont. This is another of the municipal companies. A mine telephone system to the Crown Reserve Mining Company, Cobalt, Ont. Thirty telephones to the St. Marys, Kirkton and Exeter Telephone Company, Kirkton, Ont., covering their extension this year. Also numerous other orders.

All of the above bridging telephones were the Stromberg-Carlson's new compact type.

## Electrical Outlook the World Over

Mr. H. C. Siddeley, A. I. E. E., London manager of the Lancashire Dynamos and Motor Company, recently visited Canada on his return from a tour of inspection around the globe. Mr. Siddeley's trip was largely one of inspection, though he reports having also succeeded in obtaining a number of good orders. In India, he stated, the chief development work is in the hands of the government, but a great amount of business was to be expected soon, through the development of the collieries which are being opened up in Bengal. Large irrigation works are also being carried out, and they are being combined with hydro-electric schemes. In the Malay Straits the great tin mines are now being developed extensively by electrical power. In China, great railway projects are now being developed and their works are being electrically driven. In Johannesburg, Mr. Siddeley was fortunate enough to place an order for a steam plant, which was shipped from England and placed in operation in the short time of seven weeks.

In Japan, Mr. Siddeley says, they are well advanced in matters pertaining to electricity. Most of the small towns have electric companies in operation, but there is some municipal development of street railway operation. The city of Tokio has taken over all its street car systems and combined them in one system. There are a great number of water powers in Japan, and they are being extensively developed. In Hokkaido Island, to the north of Japan, a plant has been installed for the large steel works and gun factory, which Mr. Siddeley went to start up. His company installed a 3,000 kw. steam plant there with separate motors for operating each of the tools, 30 in all.

Speaking of Canada, Mr. Siddeley said, "I think that British Columbia, and especially the neighborhood of Vancouver, will be an enormous centre for electrical enterprise." In Victoria his company installed an automatic booster, which has already been described in these columns.

In Eastern Canada Mr. Siddeley's company have not done much business yet, but they are about to open up in Toronto, through the firm of Vandeleur & Nichols. He returned home via one of the C. P. R. Empresses on August 13th in company with Mr. J. F. B. Vandeleur, of Vandeleur & Nichols, Toronto, who will make a business trip to the old country.

## Stromberg-Carlson's Outing

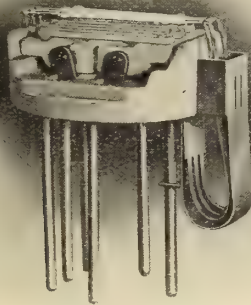
The fourth annual outing of the Stromberg-Carlson Telephone Manufacturing Company's employees was held at Manitou Beach, near Rochester, on Saturday, August 14, when a lengthy programme of athletic sports was carried out. Everybody reports a thoroughly good time. The programme issued in connection with the picnic is a very creditable work.

The appeal to the Supreme Court in the case of Lilly v. Johnston, relating to the matter of extra provincial companies doing business in British Columbia, has not yet been argued. The Premier of British Columbia has stated that there is a possibility of a measure being introduced similar to the "Foreign Corporations Act" passed last year by the British House of Commons. This would probably remove all cause for complaint.



## A Nernst Spring Holder

An innovation to the Westinghouse Nernst system is a new spring holder. This holder consists of a one-piece porcelain base similar to the old holder, and receives the wafer heater in the same manner, but is provided with an entirely new device for holding the glowers. On one side there is attached a metal stamping consisting of a series of springs, one for each glower, covered by a metal guard. A corresponding number of rigid upright supports fit into the slots in the opposite side of the porcelain. Small platinum jaws to receive the glowers are welded to the tips of the springs and to the tips of the upright supports. The glowers are provided with fused beads at the ends of their platinum leads which prevent them from slipping through the jaws of the holder. Replacement consists of the simple operation of inserting the bead of the glower in the jaw on the spring side of the holder and then drawing the spring forward sufficiently to allow the other bead to drop into the corresponding slot on the opposite side of the holder. The spring tension is sufficient to draw the glower into place, and this is done automatically without further attention on the part of the operator. Contact is made automatically. The pressure of the spring keeps the glowers in their correct position and does not permit them



New Spring Holder for Nernst Lamps.

to assume any other position due to expansion and contraction. This device greatly reduces the trimmers' time and makes it impossible for him to replace the glowers in any but the proper way.

## Three-Wire Direct Current Generators

When the load on the central station generators consists of both motors and incandescent lamps, as is often the case in small isolated plants, it is found advantageous to use what is known as the three-wire system. The motors may be connected to the outside wires at a voltage of 220, while the lamps may be operated at 110 volts, being connected between the neutral and the outside wires. This arrangement is especially advised when the motors are of the variable speed type, since the three-wire system offers an excellent arrangement for a 2-voltage variable speed control.

The general design and appearance of the Western Electric three-wire generator differs little from the standard "L" design generator. The most distinct feature in the design of these machines is a doubly wound armature, which is employed for obtaining the neutral e.m.f. point. Use is made of a special balancing winding which is placed beneath the usual armature winding at the bottom of the slots. This winding is interconnected with the main armature and with a slip ring in such a way that the slip ring always possesses a potential midway between the potentials of the two brushes. The section of the copper in the auxiliary winding is large, so that the current density is low, thereby enabling the machine to take care of very large unbalanced loads. The voltage regulation is close even under sudden or large changes in the unbalanced loads.

In order to compound for the total load on the generator under all conditions, the series field winding is divided into two parts, one-half of the coils being connected to one terminal of the armature and the other half to the other terminal; the coils on alternating poles being connected to the same side of the armature. The liability of the breaking down of the insulation is reduced to a minimum, since the coils having the full potential of the machine between them are not placed on the same pole. This arrangement further results in perfectly balanced

magnetic and electric circuits. The neutral wire is connected to the brushes, which rests on the collector rings, electrically insulated from, but mounted at the end of the commutator. This simple construction is possible because no shifting of the neutral brushes is required, no matter what amount of overload is carried.

## Westinghouse Storage Battery Company

The Westinghouse Storage Battery Company, which was incorporated July 12th, has acquired the complete plant, patents, and equipment of the storage battery department of the Westinghouse Machine Company and of the General Storage Battery Company, and will manufacture both the Westinghouse and Bijur types of storage battery. The Westinghouse Storage Battery Company enters the field with greatly increased manufacturing facilities and the best engineering talent obtainable, and will maintain thoroughly equipped testing and commercial laboratories, insuring uniformity of both materials and product. The general offices of the company will be located at Boonton, N.J., with sales offices in the principal cities of the country.

## Business Notes

The railway and engineering firm of Fellows & Fellows, Lawlor Building, Toronto, have been appointed Canadian agents for the Garwood Electric Company, of Garwood, N.J.

Mr. Fred D. Morden, electrical contractor, manufacturer and importer of gas and electric supplies, 15 John street north, Hamilton, has opened a branch office at 80 King street west, Toronto. Mr. H. W. Morden is the manager.

Messrs. Smith, Kerry & Chace, consulting engineers, of Toronto and Winnipeg, who have recently opened offices at 68 McDougall Block, Calgary, in order to deal more conveniently with their increasing business in that section of the West, would be glad to receive catalogues of electrical and engineering supplies at that address.

The commercial progress of the Ferranti meter in Canada has been very rapid. This meter has been famous in Europe for over twenty years, and it was only necessary to bring its excellent qualities to the notice of users in the Dominion to build up the present enormous sale. The makers, Messrs. Ferranti, Limited, England, have sent over a fine exhibit for the Toronto Exhibition, and their engineer, Mr. R. H. Schofield, is now in Canada studying the requirements of the market. We understand from the Canadian manager, Mr. George C. Royce, that a branch will be formed here to manufacture Ferranti meters in the near future, but in the meantime the extensive stock kept in Toronto ensures quick delivery.

The readers of the ELECTRICAL NEWS will without doubt notice the announcement in this issue in regard to "The One Light Electric Sign." For the past year Mr. Holman, who is the inventor of this sign, has managed the Canadian business of the H. & W. Sign Company, of Cleveland. A new company has now been formed with Mr. Holman as business manager, and all of the American interests are now owned by the Canadian company which is known as the Holman Electric Sign Company, with head offices in Toronto. The invention of the one light sign marks a new era in illuminated sign construction. No matter how large the sign, the bulb illuminates every letter with a brilliancy beyond conception. Unless one has seen these signs in operation, it is impossible to credit their brilliancy when illuminated. The reduction in the cost of running a sign of this construction, as compared to the multi-light sign, appeals to the careful business man. The new company are at present rushed with orders and they trust it will continue until every town in the Dominion is conversant with the "One Light Sign."

## New Publications

The Canadian Westinghouse Company, Limited, of Hamilton, have issued circular No. 1079, descriptive of their oil insulated water cooled transformers.

The Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N.Y., call attention to their new sanitary glass transmitter mouthpiece through the medium of an attractive little blotter which they are issuing.

Central stations prosecuting a campaign for a domestic load will be interested in the Westinghouse Company's new booklet on sewing machine motors, entitled "Not light running, but self-running."

A booklet issued by the Hoyt Electrical Instrument Works, Penacook, N.H., contains useful diagrams with instructions for testing coils and storage batteries. This will be particularly interesting to those engaged in automobile work.



# Recent Electrical Patents

Patents recently issued by the Canadian Patent Office, relating to electrical arts, furnished by Fetherstonhaugh & Company, Ottawa, Russel S. Smart, resident.

- 118,994. ELECTRODES FOR WELDING; W. A. Neff, Cleveland, Ohio, assignor to The Electric Railway Improvement Company.
- 119,003. INDUCTION FURNACE; R. Fleming, Lynn, Mass., assignor to the Canadian General Electric Company.
- 119,018. SHIELDS FOR THE USE OF LINEMEN; G. E. Harrison, assignor to G. Burns, Detroit.
- 119,021. RESTORING ATTACHMENT FOR TROLLEY WHEELS AND ELECTRIC SIGNALS FOR THE SAME; G. H. Brooks, Louisville, Ky.
- 119,023. PRODUCTION OF OXIDES OF NITROGEN BY THE ELECTRIC PROCESS; I. Moscicki, Frieberg, Switzerland.
- 119,033. METHODS OF AUTOMATIC REGULATION OF RECTIFIERS AND ROTARY CONVERTERS; F. B. Crocker, New York, N.Y.
- 119,036. TOOLS FOR BREAKING BANDS, WIRE AND THE LIKE; J. M. Heckman, Alphonse, Sask.
- 119,052. INSULATING MATERIALS; J. C. Dowe, Butte, Montana.
- 119,054. ELECTRIC SIGNALLING; R. A. Fessender, Brant Rock, Mass.
- 119,066. WIRE LINE FASTENERS; L. Stantin, Beaver River, N.Y.
- 119,079. ELECTRIC WELDING MACHINE; S. Z. de Ferranti, N. Sheffield, Eng.
- 119,091. SIGNALLING SYSTEMS; J. Means, Boston, Mass.
- 119,096. METERS; R. L. Rickman, Vancouver, B.C.
- 119,125. PROCESSES OF ELECTRIC WELDING; S. Z. de Ferranti, N. Sheffield, Eng.
- 119,137. ILLUMINATING DEVICES; W. H. Molloy, Hicksville, N.Y.
- 119,151. GLASS HEATING FURNACES; T. W. Freck, Jr., assignor to the Sunbeam Incandescent Lamp Company, of Toronto. In the manufacture of delicate glassware, evenness of temperature is essential and, furthermore, it is desirable to prevent the heated ware from coming in contact with material of lower temperature since this causes strains in the glass, resulting in ultimate fracture. In the apparatus at present used, the feeding doors are placed on the top of the furnace, thus allowing the heat to escape, when the doors are opened for feeding purposes. Thus considerable time and fuel are wasted in bringing the oven up to the initial temperature again. These difficulties are overcome by providing a muffle or inner oven which is kept at an even temperature by the circulation of heated air around and without it. Since the sides of the muffle are closed, except the bottom, the heat is retained. The ware is placed on a reciprocative table, which, when elevated, forms the remaining side or bottom of the muffle. When sufficient treatment has been obtained, the laden table is lowered and both table and ware allowed to cave together until ready for handling.
- 119,223. STORAGE BATTERY, ELECTRODE; L. H. Flanders, Pittsburg, Pa., assignor to Westinghouse Machinery Company. In this invention the inventor has provided means for successfully accommodating the longitudinal and lateral growth of storage battery electrodes occasioned by the deposit of peroxide on them. His electrode consists of a number of panels joined together by flexible joints, permitting the expansion of the electrode due to the longitudinal growth of the same. To cope with the lateral growth of the electrode longitudinally, extending leaves are provided with sufficient space between them to accommodate the deposit of peroxide.
- 119,229. SHORT CIRCUITING APPARATUS; H. A. Barson, C. W. Johnson, Montreal, Que., assignors to Allis-Chalmers-Bullock Company, Limited. In short circuiting, the rotor windings of electrical machines, the inventor has provided an appliance that reduces to a minimum, the frictional contact and consequent wear. By shortening the leads, the resistance of the circuit is also considerably reduced. A multipole switch is provided having leads connecting the stationary terminals of the switch to the rotor windings of the machine. The movable member of the switch consists of a shaft which can be retracted or released by a wedge operated from the exterior of the shaft of the machine by a hand wheel. The motor having been brought up to speed, the hand wheel is pulled out, and this releases the shaft or movable member of the switch, which then closes and the rotor windings are consequently short circuited.
- 119,235. ELECTRIC VIBRATORS; T. Lidberg, E. B. Overshiner, Chicago, Ill. This invention relates to electric vibrators for massage and therapeutic purposes, the vibration being caused by a pair of opposed electro magnets mounted on steel springs. On one of these movable magnets, the applicator is secured, whilst a circuit controller is operated by the vibrator of the remaining magnet or coil. Operatively associated with this coil is also a circuit breaker by means of which the attraction between the opposite poles of the magnet may be converted into vibrators.
- 119,251. AUTOMATIC SAFETY CONTROL DEVICES FOR ELECTRIC ELEVATORS; J. Ruddick, Montreal, Que. The inventor has provided an appliance for preventing the starting of the elevator if any of the shaft doors are open. A spring pressed plunger having a top of insulating material in which a circuit breaker is embedded, is provided. The opposite end of the plunger is surrounded by a spring operated sleeve which takes up the impact of the closing door. Spring terminals are provided being in perpetual mechanical contact with the plunger tip. These materials are in the central circuit of the elevator.
- 119,255. COUPLERS FOR ELECTRICAL CONDUCTORS; W. L. Bliss, Brooklyn, N.Y. Specifically applied to the couplings of electric light systems in trains, the inventor has provided a coupler which can be readily coupled and uncoupled. In his invention one of the coupling irons contains a contact terminal consisting of a number of yielding metallic leaves. Pivoted in the iron is a receiving frame to which the contact terminal of the remaining iron may be attached or detached at will, whilst means are provided for holding the terminal of the second coupling iron forcibly in contact with the metallic leaves of terminal of the other iron.
- 119,271. INDUCTOR MAGNETIC ALTERNATORS; L. J. LePontors, New Rochester, N.Y. The object is to change the density or direction of the magnetic flux quickly. The adjoining similar poles of the magnetized portions are connected together by soft iron windings and reversing is effected by a rotating element having polar faces of greater width than the space between the poles.
- 119,277. SYSTEMS FOR RECEIVING UNDAMPED ELECTRIC OSCILLATION; O. Scheller, Sleglitz, near Berlin, Germany. Two circuits, one of high frequency and the other of a lower frequency, are provided. These circuits are connected by an interrupter which is constructed to transmit impulses from the high frequency circuit to the lower, and is adapted to work with the fundamental oscillation of the latter circuit. A rectifier in the shape of an electrolytic cell is also provided allowing the energy to be transmitted in one direction only.

The Westinghouse companies report that the condition of improvement which business has undergone, during the past month, maintains the same steady rate of advance already noted during the previous months of the present year, assuring, before the close of 1909, a repetition of the busy times of 1907. The Westinghouse Air Brake Company, Wilmerding, Pa., has received a large number of orders for brake apparatus and friction draft gear. As an index of the improved conditions at the Union Switch & Signal Company, Swissvale, Pa., this plant is now employing about twice the number of men of a year ago. In June, the Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa., enjoyed an improvement of 25 per cent. over its business of May. This company recently secured a large order for railway motors from the New York Elevated Railway Company; also switchboards and auxiliary supplies, amounting approximately to \$500,000, have been ordered by the Pennsylvania Tunnel & Terminal Company for the New York terminals and tunnels of the Pennsylvania Railroad. In line with the encouraging improvement noted by the Westinghouse Machine Company, the Philadelphia Rapid Transit Company has recently placed orders for two steam-turbine equipments, of 6,000 and 12,000 kilowatts capacity, respectively.



# Current News and Notes

## Almonte, Ont.

The Electric Light Commission has decided to assist the development of a dam for the conservation of the water supply on the Mississippi river, by a grant of \$6,000. A joint stock company has been formed to construct dams at the foot of several lakes on the upper Mississippi.

## Berlin, Ont.

The People's Railway Company has completed plans for the construction of its proposed electric railway, which will connect Stratford, Woodstock, New Hamburg, Berlin, Guelph and intervening towns. It will be about 88 miles in length. A. N. Warfield, of New Hamburg, Ont., is consulting engineer, and R. T. Gough, Toronto, is chief engineer. Company will be capitalized at \$1,000,000.

## Bracebridge, Ont.

Tenders will be called shortly for the construction of the hydro electric plant, for which the ratepayers voted \$45,000. Construction will proceed when the present difficulty of obtaining a right of way is adjusted. C. H. & P. H. Mitchell, Toronto, engineers.

## Brockville, Ont.

A large water power development is being muted which involves the development of the Long Sault Rapids on the St. Lawrence river near Cornwall. The plant will be constructed and managed jointly by the Long Sault Development Company, on the American side, and the St. Lawrence River Company, on the Canadian side. The Long Sault Rapids will be utilized as a head race for three large power houses, and a dam 4,000 feet in length will be built. Besides the erection of power houses, the building of a large lift-lock and the straightening out of the various channels of the river at this point is contemplated. Construction work alone is expected to occupy over five years and will involve an expenditure of over \$20,000,000. The companies are seeking a charter from the Canadian Parliament and from the United States Congress.

## Cranbrook, B.C.

The Cranbrook Electric Light Company have decided to put in a new steam plant at a cost of \$30,000 to \$50,000.

## Chilliwack, B.C.

The construction of the last section of the Chilliwack extension of the B. C. Electric Railway Company will be commenced

at once. A station will also be built at Sardis.

## Dunnville, Ont.

The bylaws granting aid to the Dunnville, Wellandport and Beamsville Electric Railway have been carried in the townships of Moulton and Gainsboro, each township voting a bonus of \$5,000.

## Dundas, Ont.

The transformer station of the Cataract Power Company was destroyed by fire recently. The damage is placed at \$45,000.

## Hamilton, Ont.

The city council have temporarily contracted with the Cataract Power Company for the supply of fifty horse-power to operate the main waterworks pump. The council is threatened with proceedings, on the part of one of the citizens, to have the agreement set aside as illegal.

The county council recently passed a by-law giving permission to the Cataract Power Company to erect a transmission line from the Horning mountain, along the Ancaster stone road, to the Binkley hill, and thence to Dundas. This construction has been necessitated by the destruction of the sub-station at Dundas recently.

## Hartland, Ont.

It is reported that an electric road will be constructed between Hartland and For-eston. Rockland, Windsor and Knowlesville will be included in the right-of-way of this line. John E. Stewart and Hon. A. B. Donworth are interested.

## Kamloops, B.C.

Kamloops may have a 35 arc light system instead of a 25-arc system. The city council recently had the matter under consideration and acting upon the suggestion of Superintendent Wain that the former would not entail much more expense it has been decided to call for tenders for both.

## Lindsay, Ont.

This town is now able to secure electrical power at \$20 per horse-power per year.

This town has a mortgage of \$1,500 on what is known as the Burleigh Falls Power, and G. H. Hopkins, K.C., has been instructed to look up the old agreement with a view to securing the power for Lindsay. Recently the company asked \$150,000 for the Burleigh Falls Power, and the city of Peterboro made them an offer of \$50,000. The offer is laughed at by the company.

## Ladysmith, B.C.

The city council has given the tender for the municipal electric light plant to the Westinghouse Company, Limited, for a complete installation consisting of a 150 k.w., 3-phase, 60-cycle, 2200 volt generator, 10 k.w. exciter, Robb compound engine Tirill regulator, switchboard, boiler, transformers, street lamps, etc. The plant is to be erected under the direction of George M. Turner, city electrical engineer.

## London, Ont.

The Power Committee of the City Council have recommended for acceptance tenders for a considerable quantity of equipment required for the distribution station. The contract for poles was given to the Bissell Company, of Toledo, who offered to supply white cedar poles as per specifications, for the sum of \$11,100. This was considerably lower than the next, and was accepted. The same firm got the contract for cross arms, for the sum of \$1,247.50. The London Bolt & Hinge Company obtained the contract for braces, for \$423.90, and for bolts, etc., for \$317.88. The wire contract was awarded to the Wire & Cable Company, of Montreal, for \$9,292.50. The Northern Electric Company, of Toronto, was given the contract for pins for \$320, and the Locke Insulator Company, of New York, was awarded the insulators for \$640.

## Moose Jaw, Sask.

The contract for electrical supplies, meters, transformers, wire, etc., was let to the Allis-Chalmers Company, Canadian Westinghouse Company and Canadian General Electric Company, on the recommendation of the Fire and Light Committee.

## Montreal, Que.

The Montreal & Southern Counties Railway Company was recently granted a 24-year franchise by the ratepayers of Longueuil. Mr. Powell is general manager of the company.

The contract for supplying the harbor commissioners elevator with panelboards has been awarded to the Hill Electric Switch Company.

The Montreal Light, Heat & Power Company have declared a quarterly dividend on paid-up capital stock at the rate of seven per cent. per annum.

The directors of the Western Canada Power Company are C. H. Cahan, K.C., president; A. R. Doble, secretary-treasurer; T. J. Drummond and W. M. Aitken, of



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Montreal, and C. Sweeney, manager of the Bank of Montreal at Vancouver; John Hendry, Vancouver, and William McNeil, Vancouver. Mr. R. F. Hayward, who was general manager of the Mexican Light & Power Company, under the old administration, has accepted the position of general manager of the Western Canada Power Company. Mr. Hayward will assume direction of the work about August 1st. In the meantime the work of construction is being rapidly pushed, under the direction of William Kennedy, formerly of Montreal.

The old Beauharnois Canal, although of necessity kept in working order, is no longer needed for transportation purposes, having been superseded by the new canal on the north shore of the river. The old canal has, through its important system of retaining dams, afforded a site and valuable waterpower to the manufacturing town of Valleyfield, Que. Its exceedingly valuable water privileges have been acquired by the Canadian Light & Power Company, which intends to transmit electric power to Montreal. The company intends to develop 21,000 horse-power there.

#### Midland, Ont.

The Simcoe Railway & Power Company will soon proceed with the development of the Big Chute on the Severn river, thirty miles from here. A staff of engineers under the direction of C. H. and P. H. Mitchell, of Toronto, have been making extensive surveys at the site and along the route of the transmission lines. It is expected that about 4,000 horse power can be developed and distributed in this vicinity.

#### North Cobalt, Ont.

The Nipissing Central Railway, which is to build an electric railway connecting Cobalt Port, Cobalt and Haileybury, expects also to furnish electricity for lighting. The company has an authorized capital stock of \$1,000,000, and the officers are: J. W. Fitzpatrick, North Cobalt, president; P. L. Utley, Escanaba, Mich., vice-president; A. Jones, Haileybury, secretary; R. G. Stack, treasurer, and Clarence B. Henry, North Cobalt, electrical engineer and general engineer.

#### North Bay, Ont.

The Nipissing Power Company, Limited, is constructing a power plant on the South river, 19 miles south of North Bay, to supply North Bay and vicinity with electric power. The works at present being constructed are as follows: Permanent concrete head works; 1-6 foot wooden stave pipe, 3,000 feet long (giving an operating head of 90 feet); a steel stand pipe for more effective regulation; a concrete and brick power house, with an equipment of two 450 K. V. A. generators, two 925 h.p. turbines. The transmission will be 22,000 volts on wooden poles and an aluminum transmission line circuit protected by steel ground wire cable. The step-up station will be equipped with three 300 K. V. A. single phase transformers 2,200—22,000 volts. The terminal station in North Bay will have three 450 K. V. A. single phase transformers, Scott connected. The entire electrical equipment is being supplied by the Canadian Westinghouse Company, and the turbines by the Jenckes Machine Company. The president of this company is C. B. Smith, Esq., and the works are being constructed by day labor. It is expected that power will be delivered in North Bay in December. These works are being designed and constructed under the supervision of Smith, Kerry & Chace, engineers, Toronto.

#### Owen Sound, Ont.

Further contemplated telephone exten-

sions are reported as follows: To Garryowen, sixth line Sydenham, Woodford and Massey. The new Derby telephone line is nearing completion. A line from Owen Sound to Chatsworth is also under consideration.

#### Orangeville, Ont.

The Dufferin Light and Power Company is completing its transmission line from Shelburne to Orangeville, and installing a 100 k.w., single phase transformer at Orangeville. They are also increasing the generating equipment at Horning's Mill. This company supplies lighting load to Shelburne and Orangeville and transformation equipment is being built with a view to the erection of a larger power house in the near future. The president of this company is Wm. D. Wilson. Engineers in charge of design and construction of the work, Messrs. Smith, Kerry & Chace, Toronto.

#### Ottawa, Ont.

Work is proceeding on the new Ottawa and St. Lawrence Electric Railway, which will run from Ottawa to Arnprior, Arnprior to Brockville, Brockville to Morrisburg, Morrisburg to Ottawa. It is expected that cars will be run this fall.

#### Peterborough, Ont.

The Central Power Company has reduced the price of Burleigh Falls power rights to the City of Peterborough from \$125,000 to \$120,000.

#### Shediac, N.B.

Tenders addressed to E. A. Smith, president, Shediac Electric Light & Power Company, were received until August 14th for the construction of a dam across the Seadoue river.

There is a movement on foot to provide the town of Shediac with electric light. It is proposed to utilize the power at Smith's Mills and this will greatly minimize the initial cost as well as the cost of operation. It is understood that the capital required will not exceed \$15,000, about all of which has been secured.

#### Saskatoon, Sask.

Bids were recently received by J. H. Truesdale, city clerk, for one 500 k.w., 2,200 volt, 60 cycle, 150 r. p. m. two-phase generator, exciter and switchboard installed complete, and a 750 h.p., 150 r. p. m. vertical Corliss engine, with necessary condensing apparatus, installed complete. The contract has been awarded to the Allis-Chalmers-Bullock Company. Cost \$6,860.

#### Sherbrooke, Que.

A local insurance company have been making a practical demonstration of the value of lightning rods. An electric battery has been used to furnish the lightning and both unprotected and lightning-protected buildings were experimented with. The tests have been very successful.

#### Toronto, Ont.

The city is calling for tenders for 16 synchronous and induction motors, with exciters, switchboard, etc.

The following leases of water powers have been cancelled owing to a non-fulfilment of lease: J. A. Powers, water power on the Mississauga river, Algoma district; L. Demainville and G. H. Hillyer, water power on Alice O. Falls, Rainy river; MacKenzie Power and Development Company, at Canal Rapids, Parry Sound; J. Kilgour, W. D. Woodruff, C. Mitchell and H. H. Dewart, at Deux Rivières on the Ottawa river; town of Webbwood for power at Birch Falls, Algoma; W. H. Upham, A. Shores and E. G. Filer, at Steep Rock Falls, Rainy river; F. Bolton, for power on Long Lake river, Rainy River.

It is reported that the T. & N. O. Commission will develop power on the Abitibi river at the Iroquois Falls for the purpose of obtaining electric power. It is estimated that at this point a 25-foot head is available and that more than 5,000 h.p. can be developed. The power will be made use of when the contemplated electrification of the T. & N. O. lines takes place.

The contracts have been awarded for the building of the Niagara Falls step-up transformer station and for the Dundas inter-switching station in connection with the Hydro-Electric power scheme. The successful tenderer was John Hayman & Son, London, Ont., whose tender was the lowest received. For the Niagara building the price received will be \$47,700, and for the Dundas station \$35,000. Six tenders, differing from highest to lowest by \$15,000 were received for the Niagara station, while four, with a difference of \$7,000, came in for the inter-switching station at Dundas. The price at which the government will get the buildings is considerably below the estimated cost.

The contract for the erection of the stations of St. Marys, Stratford, Berlin and Guelph were awarded to Edge & Gutteridge, of Seaforth, at \$18,700 each, while those at Preston, Paris, Woodstock and St. Thomas went to John Hayman of London, at \$19,850 each. The contract for the supplying of 12,000 galvanized clamps to carry the cable was given to Pratt & Letchworth, of Brantford, the lowest tenderers.

The contract for laying the conduits for the civic power plant has been signed by Golden & Lansing, of Troy, N.Y. The firm have commenced operations. The cost of laying the conduit in the down-town section will reach \$65,000.

The Hydro-Electric Power Commission announce that the total cost of securing the right of way for the power transmission line from the Falls to Toronto and elsewhere will be \$75,000.

#### Verdun, Que.

The council is considering the advisability of negotiating a loan of \$150,000, the proceeds to be used for the installation of an electric light plant.

#### Victoria, B.C.

The ten thousand horse-power development of the B. C. Electric Railway at Jordan river is at a standstill, owing to the city council not being fully satisfied with the terms of the agreement, which calls for the power to be developed as may be required in extensions of the electric railway, lighting and power undertakings of the company. An expenditure of \$1,500,000 is involved.

#### Vancouver, B.C.

The contract for the construction of 12 miles of the B. C. Electric Railway on the Chilliwack section, between Abbotsford and Miles district, has been awarded to the Puget Sound Dredging Company.

It is the intention of the British Columbia Electric Railway Company to extend its lines to Huntingdon.

The British Columbia Electric Railway Company has made application for 30,000 miners' inches from Indian River, near Vancouver, and proposes to erect an auxiliary power plant. R. H. Sperling is general superintendent, British Columbia Electric Railway.

The Vancouver Power Company, capitalized at \$2,500,000, has given notice that application will be made under the Water Act for a license in the New Westminster District. The company wish to divert a part of the Misliloet river, North Arm, Burrard Inlet, some 12 miles above the



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## For Sale

At a sacrifice, 1-150 k. w. Generator manufactured by the Canadian General Electric Co., 2200 Volt, 2 Phase, 134 Cycle complete with Marble Switch Board, Excitor, Instruments, Lightning Arresters, etc. This apparatus was only in use two years. I will guarantee that the machine is in as good condition as when it left the factory. No reasonable offer refused. Apply to Supt. Electric Light Dept., City of Edmonton, Alberta.



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THOS. C. IRVING,

Gen. Man. Western Canada, Toronto

**THE COMMERCIAL**  
ESTABLISHED 1892  
7th WEEKLY FINANCIAL, COMMERCIAL & GENERAL TRADE NEWSPAPER OF THE GREAT WEST.

Winnipeg, Manitoba

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LONG EXPERIENCE  
IN PATENT LITIGATION  
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mouth of the river, for a water power plant for the purpose of generating electricity for mechanical, industrial and commercial purposes. The company wish some 800 cubic feet of water per second for this plant.

### Weyburn, Sask.

The Weyburn Machine Electric Light Company contemplates the erection of 3 miles of transmission lines and the installation of an additional boiler. Geo. V. Reed is manager.

### Windsor, Ont.

The Windsor Tunnel & Lake Erie Railway Company, it is stated, will soon start construction on its line which is to connect Windsor, Sandwich, West Vereker, New Canaan, McGregor, Huron and Oxley, with a total length of about 30 miles.

### Welland, Ont.

Mrs. L. J. Felker has issued a writ from the High Court of Justice against the F. H. McGuigan Construction Company and DeMuralt & Company, sub-contractors for the construction of the Hydro-Electric transmission line in Gainsboro township, to prevent further erection of towers on her property and also asking for the removal of construction work already proceeded with and for damages for trespassing. It is expected that the township of Gainsboro will also issue a writ against the contractors, restraining them from placing their transmission lines upon the highways of the township, or sufficiently near them to endanger public safety.

### Winnipeg, Man.

Tenders addressed to M. Peterson, secretary, Board of Control, were received until August 11th for supply of 20,000 1/2 by 12-inch carbons; 50 alternating current series enclosed are lamps; 50 absolute cut-outs. Specifications and forms of tender may be obtained at office of City Electrician.

The tender of the Miller Morse Hardware Company has been accepted for the supply of wire fence and gates to be used in fencing the power transmission line right of way. The contract calls for 2 1/2 cents per rod for the fence and for each gate \$5.30.

The differences between the electrical contractors and the electrical workers' union have been adjusted. The schedule of wages has been increased from thirty to forty cents per hour. The contractors insist that in future the union must file its demand before February 1st in order that wages may be figured on in submitting tenders.

## Telephone News

### Athens, Ont.

Several rural telephone lines in Leeds and Greenville are forming a federation and will erect an exchange at Athens.

### Carievale, Sask.

The Carievale Telephone Company, Limited, has recently been incorporated.

### London, Ont.

The Bell Telephone Company is planning to place its wires in conduits in this city, the cost of such work being estimated at \$50,000.

### Lethbridge, Alta.

The Automatic Telephone Company will install equipment at Lethbridge and East Calgary at the instance of the Alberta Government. Several other cities will also probably be similarly equipped during the summer.

### North Portal, Sask.

Tenders have just been taken for building 31 miles of telephone lines at this place. Address Jno. Hill, Secretary-Treasurer, North Portal Rural Telephone Limited.

### Ottawa, Ont.

The Bell Telephone Company has made application to the city for authority to open up for its lines portions of the following streets: Metcalfe street from Queen to Slater, and Slater from Metcalfe to Bay.

### Port Arthur, Ont.

The City Council has decided to buy out all the holdings of the Bell Telephone Company at this place for \$3,500.

### Regina, Sask.

With head office in this city, the Rose Plain Telephone Company has been incorporated to build rural telephone lines in the vicinity of this city.

The Provincial Government at Regina has awarded the contract for the completion of the long distance telephone line from Saskatoon to Prince Albert to J. S. Bartleman, of this place. The line will be completed by fall.

### Thamesville, Ont.

The Thamesville Telephone Company has been incorporated with a capital of \$10,000. Provisional directors, W. J. Mitton Cambden, T. Marven and J. Coutts, of Thamesville.

### Toronto, Ont.

The City Council have referred the matter of inequality of rates, charged by the Bell Telephone Company in this city, to the Board of Railway Commissioners. The City Solicitor in conjunction with a telephone expert, will prepare the city's case.

### Toledo, Ont.

The Rural Telephone Company of Kitley, with main office at Toledo, has been incorporated with a capital stock of \$10,000. A. R. Hanton, J. M. Edgar and R. T. Beckett are the provincial directors.

### Victoria, B.C.

The British Columbia Telephone Company has completed a long distance line between this city and Cumberland. The line was formally opened last week. It has been in course of construction for the past six months, and is all of copper, making the transmission perfect. Nanaimo was the farthest point north reached by the telephone system formerly. The new line adds another seventy miles of wire, and gives communication with Parksville, Little Qualicum and Union Bay. At the present time the company is installing a branch exchange in Cumberland and in Courtenay. From this point it is proposed to extend the line up the Courtenay Valley and down to Comox Bay.

### Woodbridge, Ont.

The Union Telephone Company of this town are endeavoring to obtain permission to erect a line in Etobicoke Township.

### Winnipeg, Man.

The Manitoba Telephone Comissioners have 3,000 applications for permission to build rural telephone lines.

## NEW COMPANIES.

Recent incorporations in the Province of Saskatchewan include: Pheasant Plains Rural Telephone Company, Limited, Blackwood, Sask.; the Condie Rural Telephone Company, Limited, Condie, Sask.; the Oxbow Farmers' Rural Telephone Company, Limited, Oxbow, Sask.



## Canadian Cedar Telegraph, Telephone and Electric Light POLES

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## Tenders

A few dollars spent in advertising your proposals in

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would result in additional competition, which might save your city or town or your client many hundreds of dollars.

## You Can Reduce Your Transformer Expense

and increase your receipts by using

# "Moloney"

High Efficiency

## Transformers

because they show remarkably low core losses.

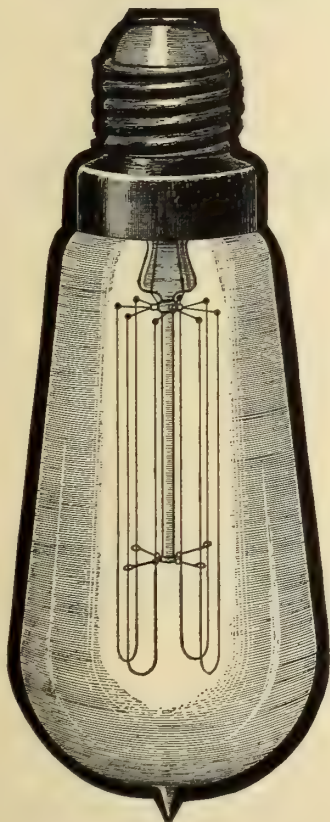
We have the best of good reasons for believing that these losses are lower than can be shown by any other transformer in the market. :: :: ::

We back this belief with a guarantee that they will not exceed certain definitely specified amounts. The savings effected by these reduced losses should amount to about 20 per cent.—you save the purchase price every five years. Write for proof.

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Toronto

### Meetings and Conventions

Canadian Independent Telephone Association, annual convention, Toronto, September 8th, 1909.

Canadian Manufacturer's Association, annual meeting, Hamilton, September 14th, 15th and 16th, 1909.

International Association of Municipal Electricians, fourteenth annual convention, Atlantic City, N.J., September 14th, 15th and 16th, 1909.

American Railway Bridge and Building Association—October 19-21. Nineteenth annual convention at Jacksonville, Florida. Secretary, S. F. Patterson, Boston & Maine Railway, Concord, N.H.

Nova Scotia Society of Engineers: September 9 and 10. Third annual meeting at New Glasgow, N.S. S. Fenn, Halifax, N.S., secretary.

Death & Watson, electric sign manufacturers, have recently installed the largest overhanging sign in Toronto on the new building of the Gerhard Heintzman Company, Queen street west. This sign is a double sided panel in three sections, and bears the words "Gerhard Heintzman Pianos" in 18-inch letters. The lamps are ruby, and at night, as well as day, the sign forms an attractive advertisement.

The same firm have lately erected signs for Slater Shoes, Fairyland, McKenna Book Store and United Cigar Stores, as well as shipping new signs to Hamilton, Ont., Lethbridge, Alta., Fort William, Ont., and Fredericton, N.B.

Electric fans for picking chickens have been devised for wholesale poultry dealers. It is stated that all the feathers and down are removed in a few seconds by plac-

ing the dead chickens into a receptacle equipped with a powerful electric blower.

### MOONLIGHT SCHEDULE FOR SEPTEMBER.

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Sep. 1	7 00	Sep. 1	9 20	2 20
2	7 00	2	9 50	2 50
3	7 00	3	10 20	3 20
4	7 00	4	10 50	3 50
5	7 00	5	11 30	4 30
6	6 50	7	0 10	5 20
7	6 50	8	1 00	6 10
8	6 50	9	1 50	7 00
9	6 50	10	2 50	8 00
10	6 50	11	3 50	9 00
11	6 50	12	4 50	10 00
12	6 40	13	4 50	10 10
13	6 40	14	4 50	10 10
14	6 40	15	4 50	10 10
15	6 40	16	5 00	10 20
16	6 40	17	5 00	10 20
17	6 40	18	5 00	10 20
18	6 30	19	5 00	10 30
19	6 30	20	5 00	10 30
20	6 30	21	5 00	10 30
21	6 30	22	5 00	10 30
22	6 30	23	5 00	10 30
23	10 00	24	5 00	7 00
24	11 10	25	5 00	5 50
26	0 20	26	5 10	4 50
27	1 40	27	5 10	3 30
28	3 00	28	5 10	2 10
29	No Light	29	No Light	
30	6 10	30	8 10	2 00

• Total.....201 40

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Contractors to **H. M. Government, War Office, Admiralty**, also to the Principal Corporations in the British Isles and Abroad for Electric, Traction, Power, Lighting, Telephone and Telegraph Equipments. Also Manufacturers of Paper, Lead Covered, Rubber, Gutta-percha and Bitumen Insulated Cables; Flexible Cord, Cotton Covered Wires, etc., etc. Also Junction Boxes, Section Pillars, Overhead Tramway Gear, Bonds, Switchboards, Meters, Telephone Instruments, Exchange Equipments, Batteries, Insulators, Fire Alarm and Police Equipments, Railway Signals, Blocks, etc., etc.

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# No Matter What the Machine is ————— ————— This is the Way to Raise its Efficiency

You can drive any machine harder and rack it less—

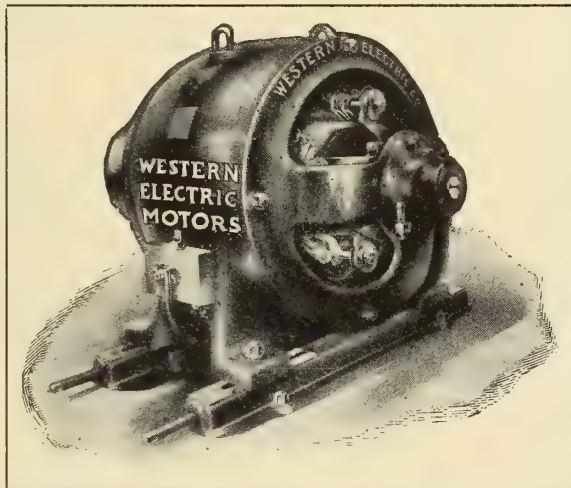
You can lessen power-cost considerably—very considerably indeed—

You can eliminate probably as much as fifty per cent. of power waste—

with Western Electric Motors, which maintain a uniform, unvarying speed whether the load is heavy or light; which economize floor space greatly; which give a most perfect control of stops and starts to the operator;

and which are the practical expression of years of designing motors for hard usage and cost reduction. These motors can be supplied for either direct or alternating current.

**Western  
Electric**



**Hawthorn  
Motors**

This motor will save you from 25 to 50 %  
of your power costs.

You are welcome to Bulletin 107  
for the asking.



It goes into this power question in a  
way that will appeal to you strongly.

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# Canadian Independent Telephone Co.

Toronto, Canada

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We have claimed and now reiterate that we have the only Canadian factory actually manufacturing telephone equipment in the Dominion that is not connected with or controlled by the Bell Telephone Co.

## Get the Facts

Test carefully all statements made in regard to Canadian Independent Telephones and the facts will guide you right as to Canadian factories. We are equipped to manufacture either for rural lines or the Automatic (Canadian Machine Telephone Co.) for city service.



## Quality Talks

The Canadian Independent Telephone Company have made a reputation for satisfactory service, up-to-date design and good appearance. Scores of companies using other makes have changed to the Canadian Independent Telephone after one practical test.

## Information Free

Write us for full information and a copy of our Bulletin on rural telephone construction. All information and estimates furnished free of charge by our engineers.

## Construction Supplies

We carry a full stock of all kinds of wire and construction material. Ask for price list.

## Fully Guaranteed

All our telephones and switchboards are guaranteed for ten years and you can be sure of material and workmanship being first-class.

Prompt Shipments and Guaranteed Satisfaction are Building up Our Business

# Canadian Independent Telephone Company

Duncan Street

Limited

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Toronto



# STROMBERG - CARLSON

## Means Quality



No. 896 Compact Type Magneto Telephone  
5 Bar Generator. 1600 Ohm Ringer

### Some Reasons Why This Magneto Telephone Has Created a Sensation

In the first place, it is a good looking Compact Magneto Telephone. We reduced the size of the cabinet 5 inches and re-designed the transmitter arm and switchhook so that the complete instrument could be packed in a closed wooden box, one-half the size of most telephone packing cases, thereby taking off 14 pounds weight for every individual telephone shipped. You pay the freight, and this feature alone saves you 30 per cent. for transportation charges.

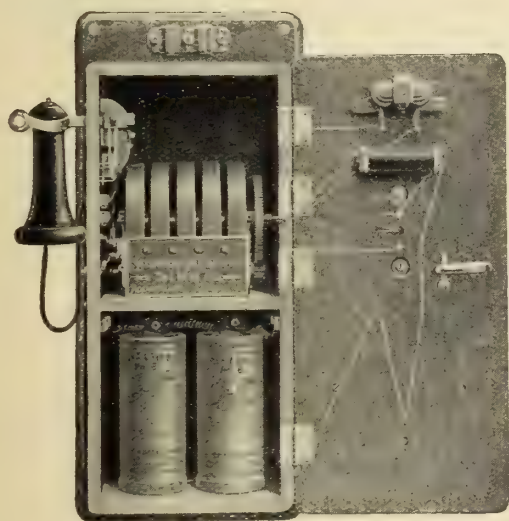
It is the only Magneto Telephone having the combined features consisting of a detachable transmitter arm, switchhook and writing shelf, removable hand generator and outside ringer gong adjustment.

It has the most accessible and likewise practical assembly of any Magneto Telephone made. Every part is where it can be gotten at without removing some other associated part.

It is the only Magneto Telephone made entirely in one factory. No other manufacturer conducts such thorough electrical and mechanical inspection tests as this Company before allowing a single telephone to be packed.

It is real "Quality Apparatus" not equalled in design, efficiency or workmanship by any known make regardless of price. This is the utmost value for your money on the market to-day.

We want your trial order.



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Ontario Sales Agent:

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in tight corners there is nothing to equal the

**Baby Gasoline Torch**

The smallest practical torch made. Perfect, powerful and durable. Lights with a match.

This torch is a necessity for every repair kit.

**Burns without Air Pressure**

A simple automatic tool, with no movable parts, valves or pump to get out of order or be replaced. Tank is only three inches high and two in diameter. It requires no pumping and is always ready for use. Simply hold a lighted match to the burner—it lights quickly. Will burn steadily for two hours on one filling of gasoline.



This torch will be sent express prepaid to any address in Canada on receipt of \$1.25.

**Crescent Company**

4 McGill Street, Valparaiso, Indiana, U.S. A.

**Central Stations**

should be up to the times and secure new business through addition of electric signs to their circuits. Get **Death & Watson** to sell signs for you.

Write us about it.

**Death & Watson**

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**The Sign that Satisfies**

MR. JAS. T. HOLMAN, Inventor of the One-Light Electric Sign, begs to inform the readers of the Electrical News that he has formed a new company to succeed the A. & W. The new company will be, and is styled The Holman Electric Sign Co., and now own and control the manufacture of the One-Light Electric Signs in Canada.

**WE WANT CENTRAL STATION MEN**

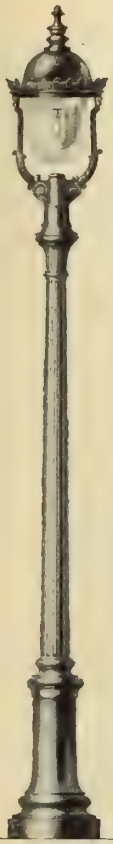
everywhere to correspond with us in regard to taking orders for our signs. Hundreds of our One-Light Signs are now in use, giving the very best of satisfaction. From now on is the time to sell these signs and our factory is in shape to fill all orders promptly. We make designs suitable for any line of business and our prices are about one-third the price of any other electric sign. Our signs have a double value, being a clear and plain day sign and a brilliant night sign. Write for catalogue and full particulars in regard to our selling plan.

**The Holman Electric Sign Co.**

36 Yonge St. Arcade, TORONTO, ONT.

INVENTORS AND SOLE MAKERS OF THE ONE-LIGHT ELECTRIC SIGN





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Catalogue on application  
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If you are having any trouble with your plants send for us at once and we will do your repair work promptly and economically. :: :: :: ::

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Room 121

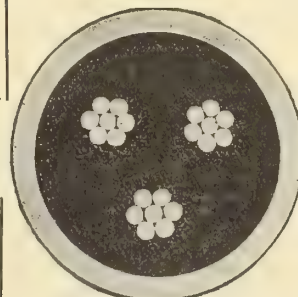
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**Electricity in Kodak Films**

Some of the hitherto unexplainable tricks played upon photograph films have been found to be caused by static electricity, says "Popular Electricity" in a recent issue. The band of celluloid that serves as foundation for the layer of gelatino-bromide becomes electrified by contact with the black paper that protects the roll against light, or simply by contact with the next sensitive layer in the roll, so that in certain conditions there are actual electrical discharges that leave their traces on the image, after development, in the form of branched or zigzag lines. A warm and dry atmosphere seems to favor the accident, which occurs notably when the operator removes the roll from the apparatus; if the spool is partly unrolled he squeezes it lightly and thus gives a slight motion of rotation to the interior coils; friction then determines the phenomenon, and the harm is done.

**Steel Hangers in Street Cars**

One of the objectionable features of the ordinary street cars in large cities is the fact that they are provided with leather hand straps, which are liable to accumulate dirt and disease. As a substitute for these unsanitary straps a steel hanger has recently been devised, which is covered with porcelain enamel, so that it may be kept absolutely clean. These straps are being tried by the Interborough Rapid Transit Company of New York.

**Novel Telephone Clock**

A novel device has been invented for use in hotels, to enable the patrons to determine the exact time at any hour of the day. A small telephone received is connected to the head of the bed in each room, and may be placed under the pillow, if desired. The device is connected to a master clock. When the sleeper wishes to know what time it is, he places the 'phone to his ear and presses a button. A set of gongs will then strike the hour, the quarter, and the number of minutes past the quarter.

**Revolting Conversation at the Plant**

"Watt-hour you doing there?" asked the boss.

"Eatin' currents," replied the apprentice, shamefacedly. "Anode you'd catch me at it."

"Wire you insulate this morning, any-way?" demanded the boss.

"Leyden bed."

"Wouldn't that jar you! Can't your relay-shuts get you up mornings?"

"Amperently not."

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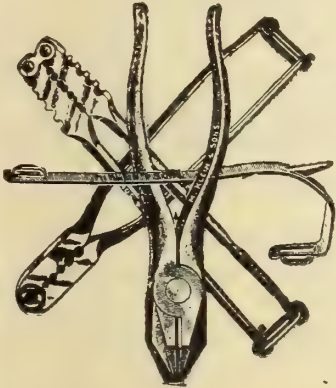
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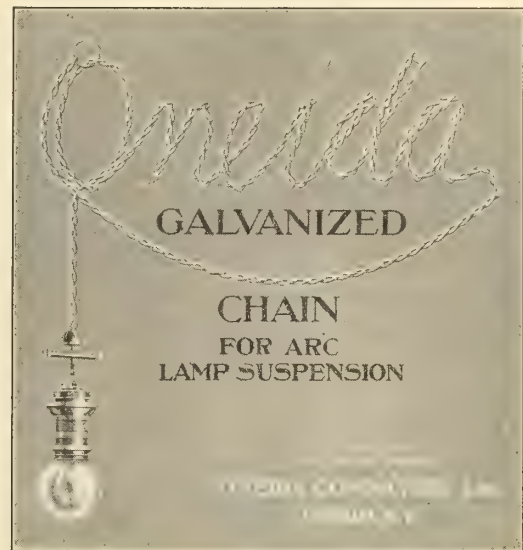
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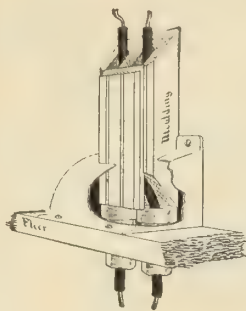
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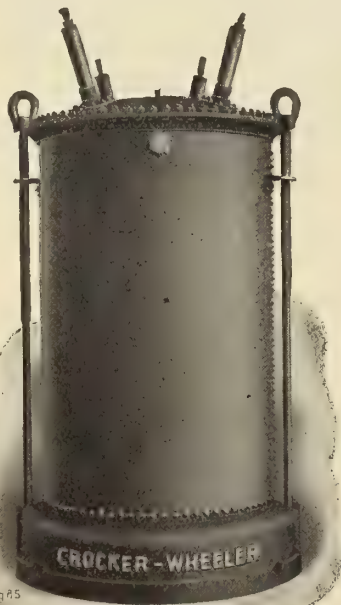
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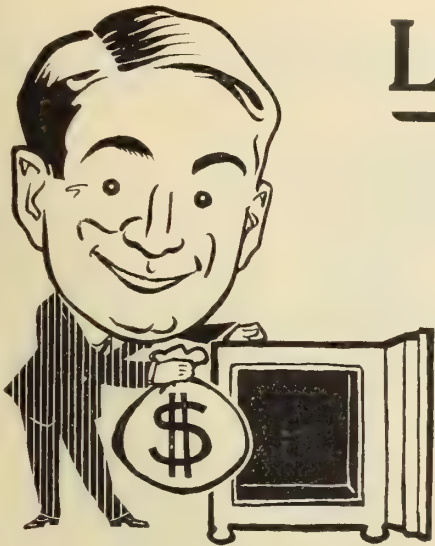
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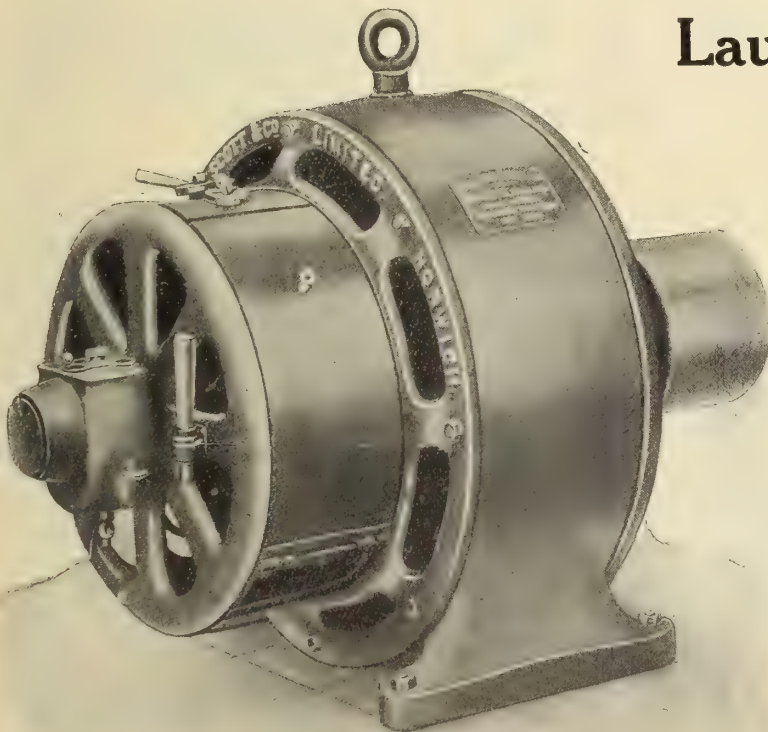
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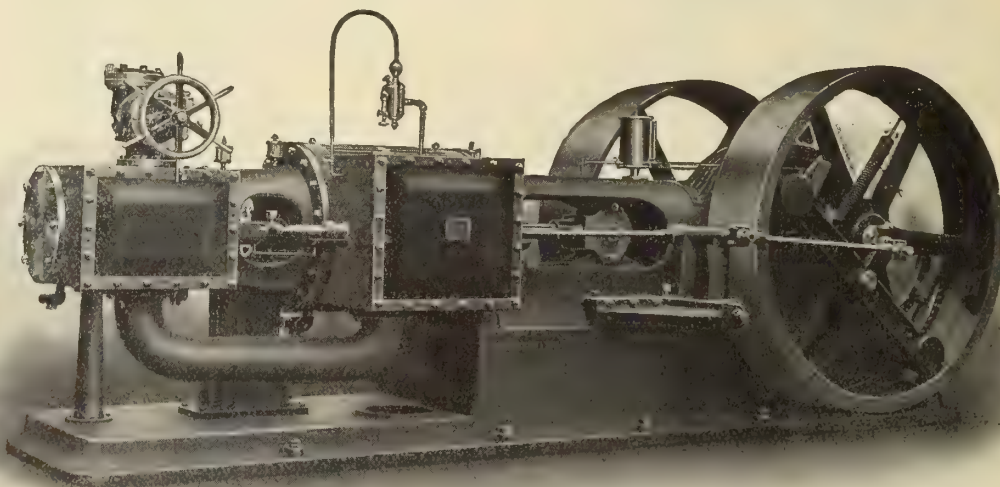
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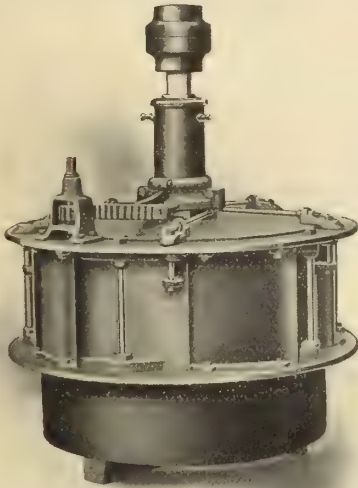
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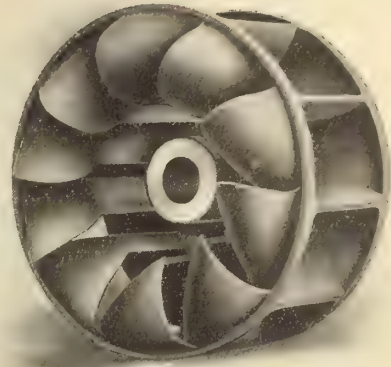


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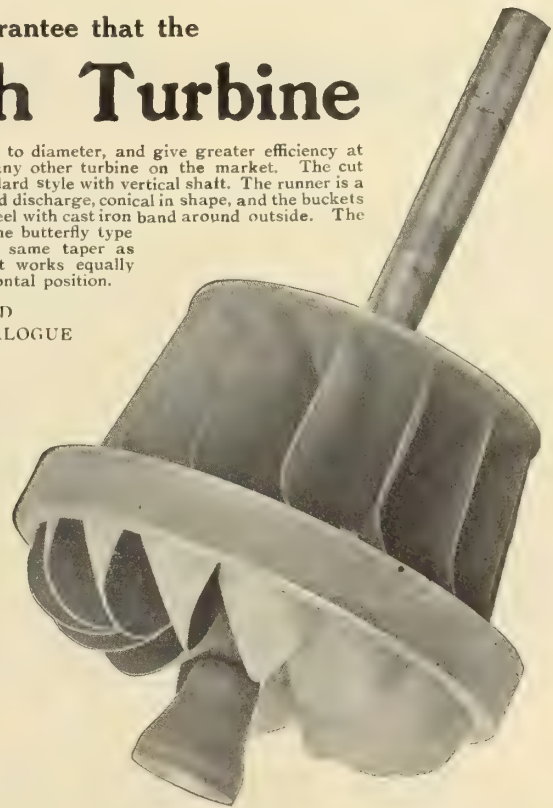
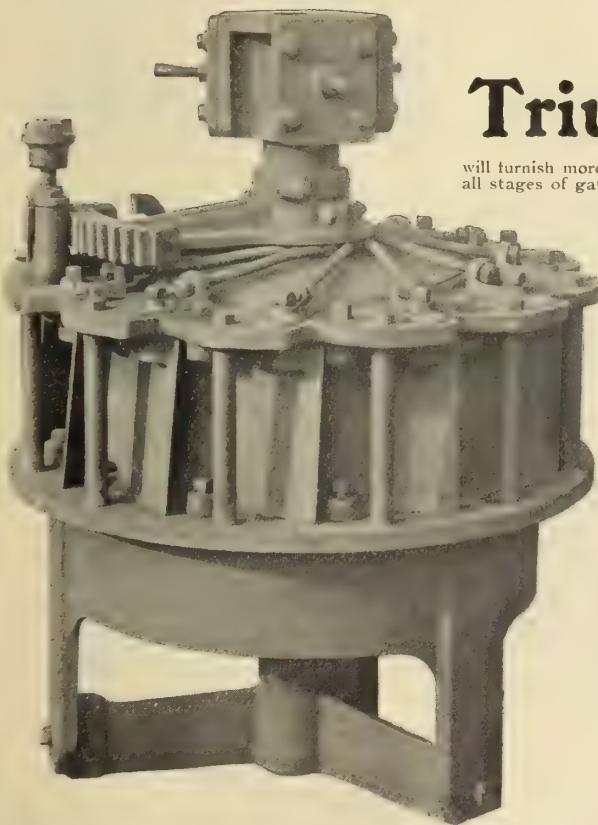
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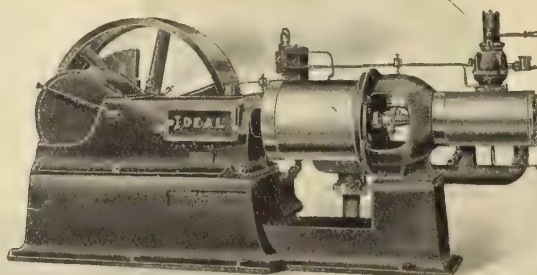
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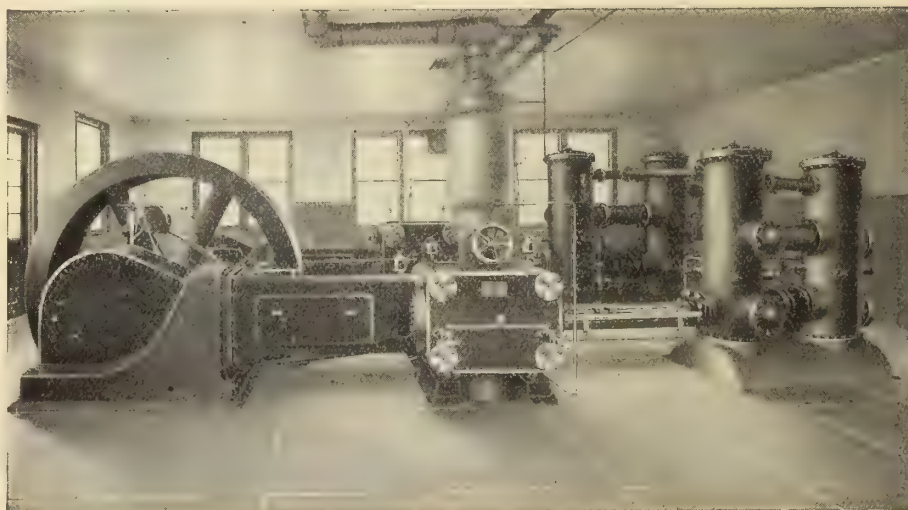
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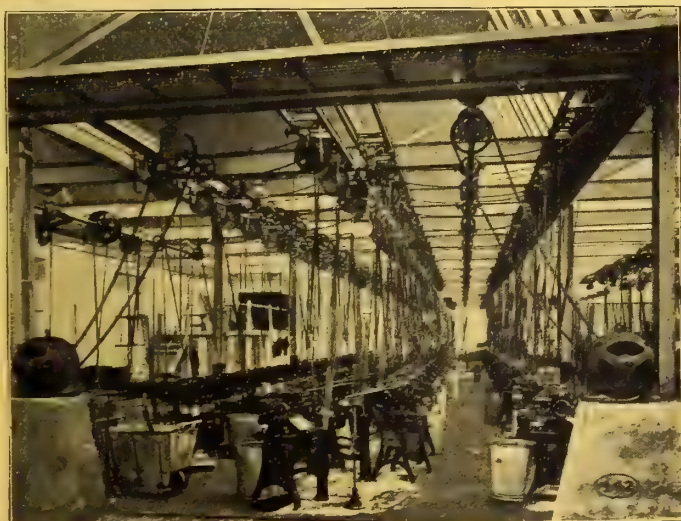
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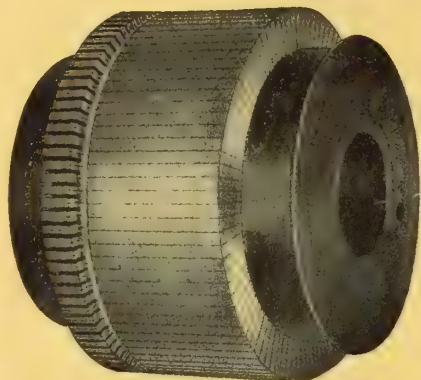
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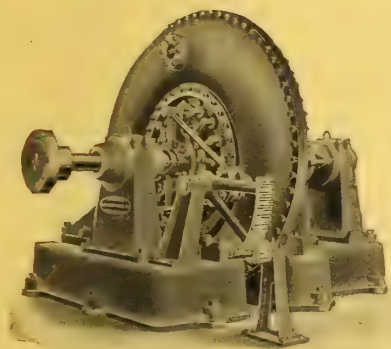
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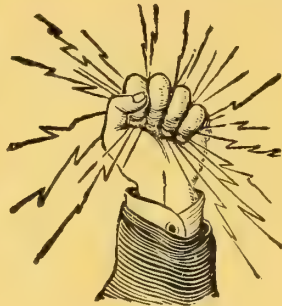
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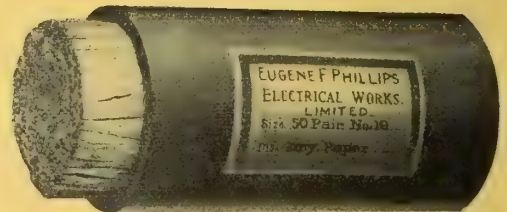
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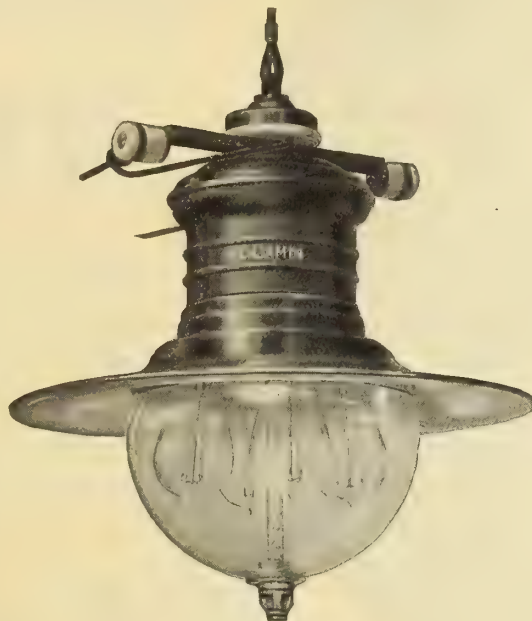
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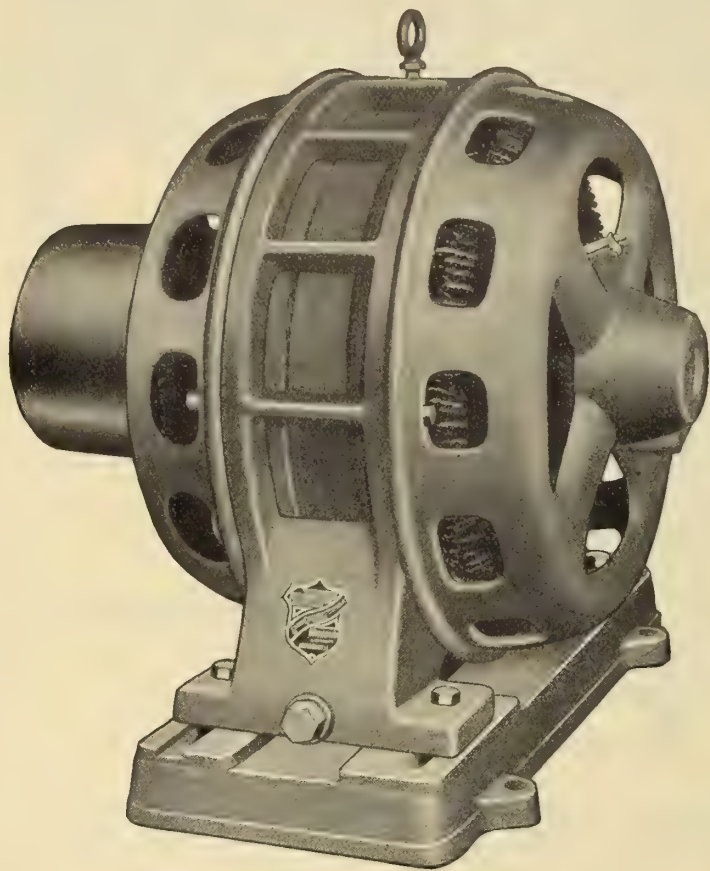
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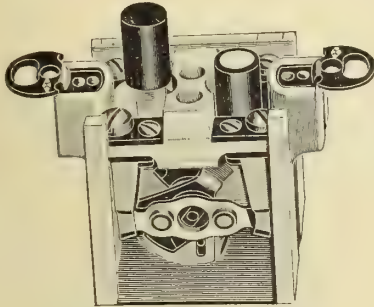
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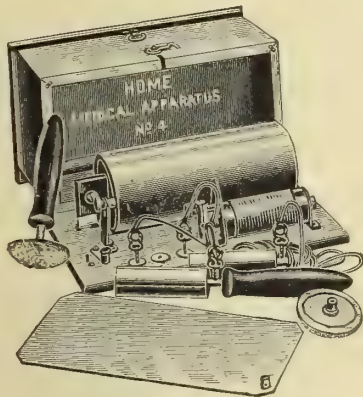
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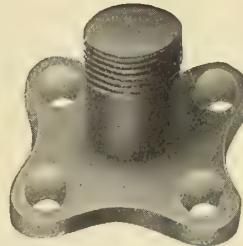
Medical Batteries



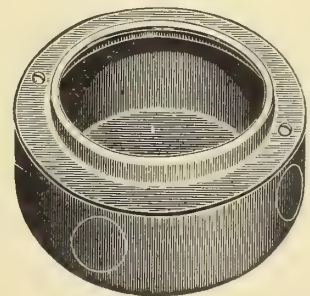
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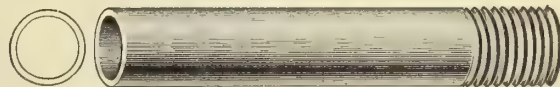
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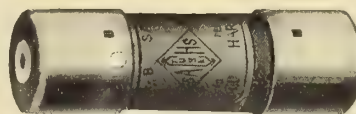
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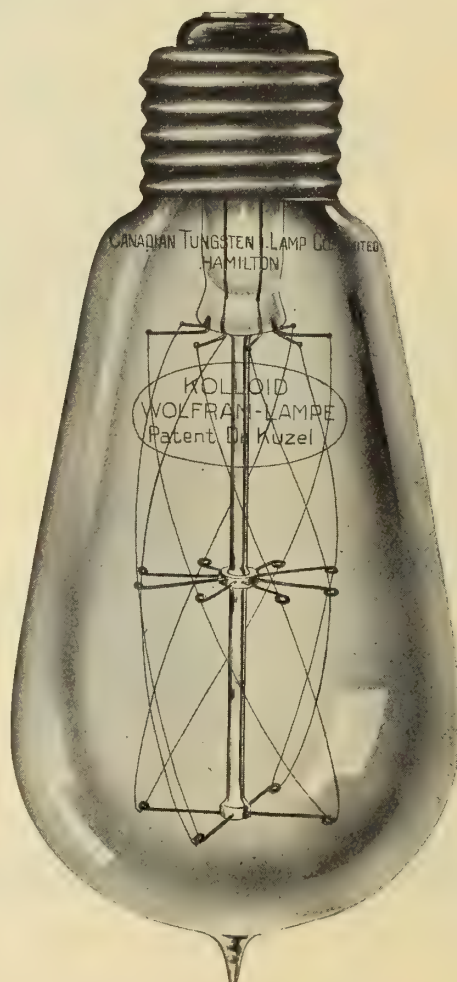
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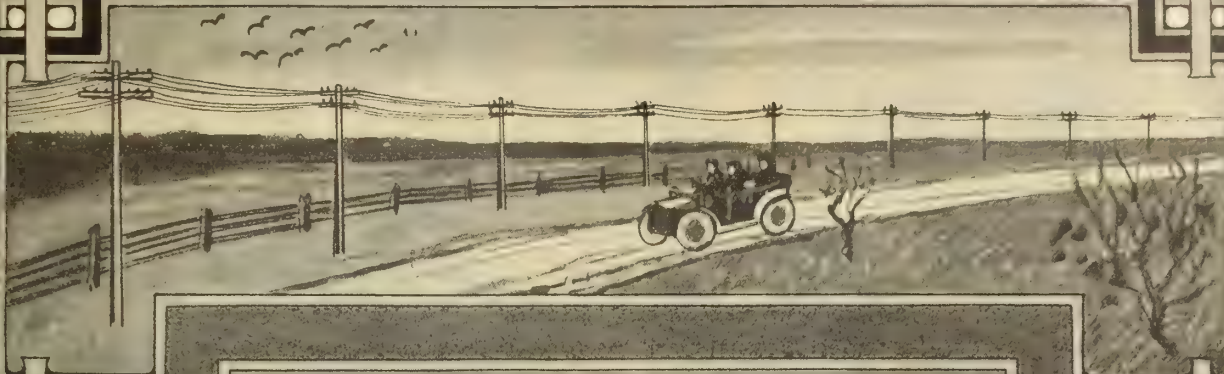
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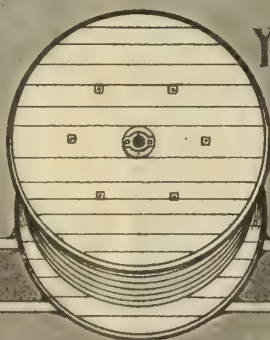


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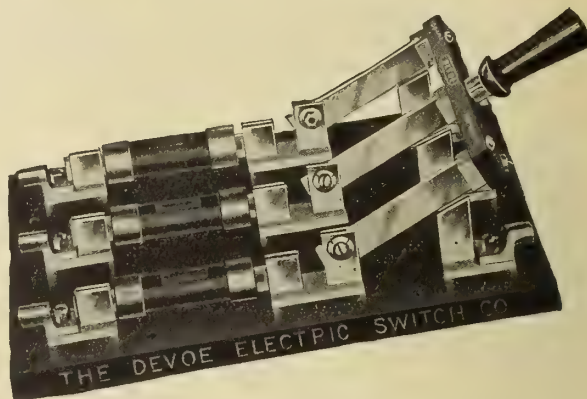
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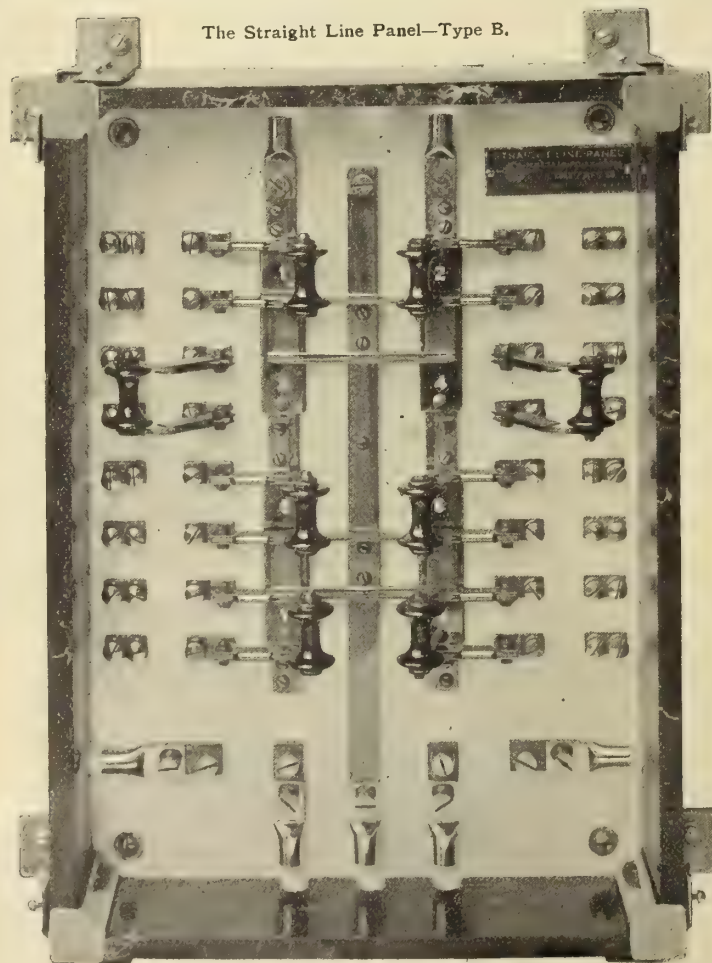


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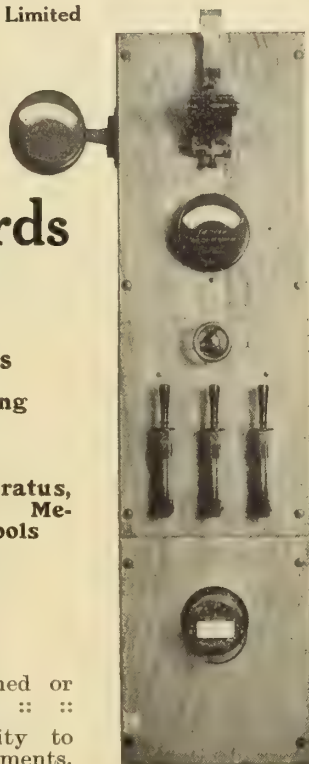
Special Electrical Apparatus, Commutators, Special Mechanical Apparatus, Tools

Metal Novelties

Metal Devices

Special Machinery designed or built to specifications. :: :: ::

We solicit an opportunity to quote on your requirements.



## The New Weston Alternating Current Switchboard Ammeters and Voltmeters



will be found vastly superior in **accuracy, durability and workmanship** to any other instruments intended for the same service.

They are

ABSOLUTELY DEAD BEAT. EXTREMELY SENSITIVE. PRACTICALLY FREE FROM TEMPERATURE ERROR.

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PRACTICALLY INDEPENDENT OF FREQUENCY AND ALSO OF WAVE FORM.

They require

EXTREMELY LITTLE POWER FOR OPERATION AND ARE VERY LOW IN PRICE.

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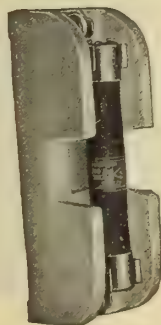
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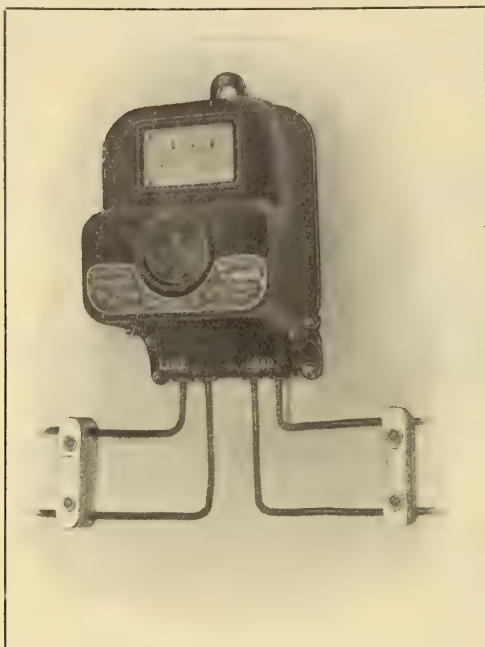
Very careful tests of various Fuse Constructions as found in different makes of Fuses, under the most severe Short Circuit show that our Fuses act perfectly inside and out.



Why Not Try Them?

# CHASE-SHAWMUT CO.

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*Packard*

Type "G"

## Integrating Wattmeters

now in use in Canada. You'll find it in the accuracy with which this meter registers the light as well as heavy loads.

By employing the highest class of workmanship in every part of the Packard Meter, and using carefully adjusted ball bearing we have reduced friction to a minimum.

Its sensitiveness and accuracy make it the one meter that can be depended upon to correctly register the light loads of Tungsten and other high efficiency lamps which are now being so generally used.

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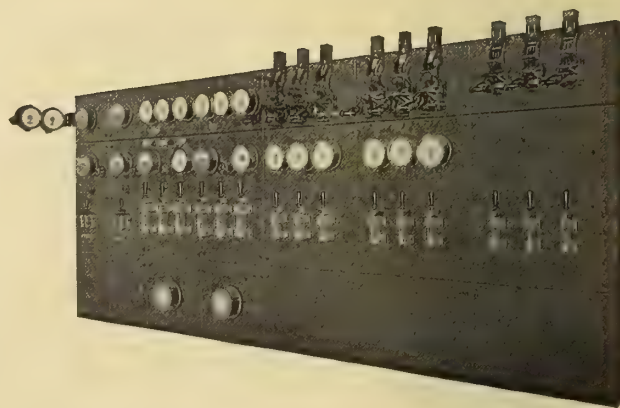
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The Standard panel sections adopted by the Westinghouse Company are the result of extensive experience which has demonstrated that the panel dimensions selected, secure the best results in design, operation, maintainance, appearance and economy of space, to which sections of equal height do not readily lend themselves.

The board illustrated is made up of Westinghouse standard panels for the heaviest capacity of low tension, alternating-current service, for use on circuits of 500 volts or less.

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maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalies. They improve with age.

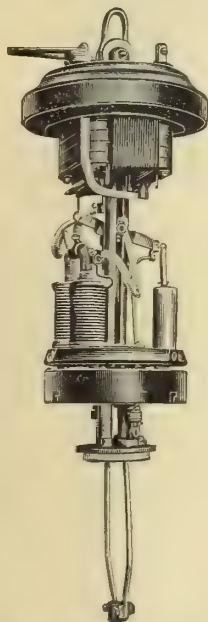
The plain insulation [without a protective covering] is soaked three days in water before being tested.

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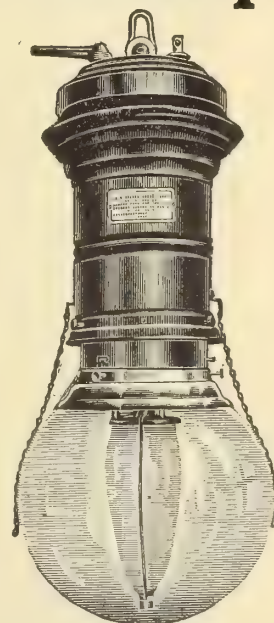
is the only silent lamp. The balanced beam arrangement of magnets and dash pot secures a minimum size of solenoids and core.

These together with the careful methods adopted for suspending the magnetic parts ensure a lamp absolutely free from hum or noise.

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**Long Carbon Life      Strong Construction**  
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A trial of this lamp will convince any engineer that it is without exception the best A.C. multiple lamp on the market. Ask for bulletin and prices.



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can only be secured by installing fixtures that are carefully designed to meet special requirements. :: :: :: :: :: :: ::

We manufacture the latest lighting effects from our own original designs. Our line of fixtures and electroliers is wide enough to suit any purse, large or small.

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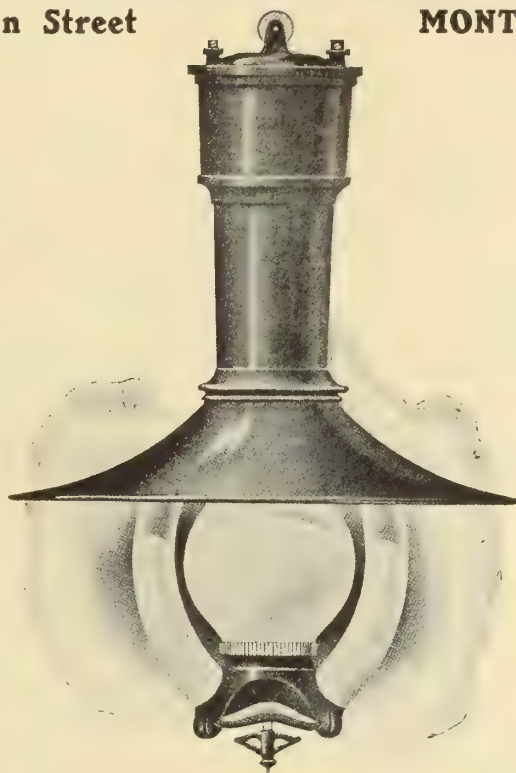
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We carry a complete stock.

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Giving life per trim of 10-18-35-50 and 80 hours.

Any frequency.



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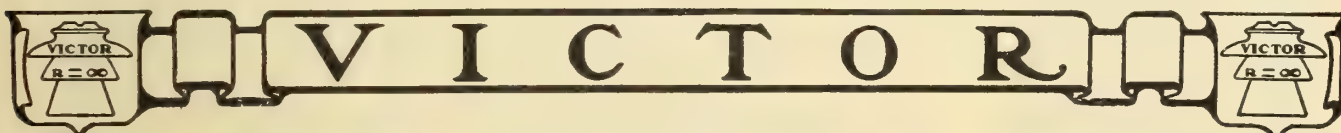
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"Excello" Incandescent Lamps

Excello Metal Filament Lamps

Arc Lamp Carbons, Imported

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**S**HOWING four "Victor" Suspension Insulator Units under severe rain test at 205,000 volts; also a 65-ft. steel tower equipped for 100,000-volt operation. This is part of an experimental tower line at Victor, 800-ft. span, running up to 350,000 volts.

*"Victor" insulators are good and they are safe.*

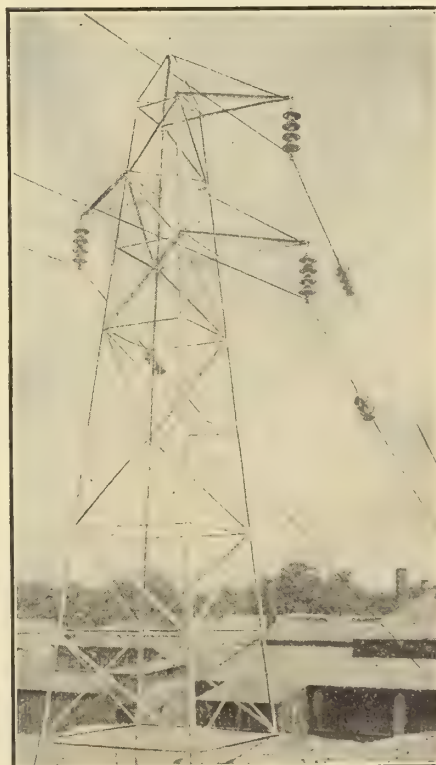
**The Locke Insulator Mfg. Co.**

Victor, N. Y., U. S. A.

**Montreal Office:**

**The Engineering Equipment & Supply Co.**

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# Arc Lamps for all Circuits

We are Specialists in the Manufacture  
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Send in Your Specifications or at least Write for Bulletins

**The Adams-Bagnall Electric Co.**  
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Canadian Representative

**R. E. T. PRINGLE, Room 209 Townships Bank Bldg., Montreal, P. Q.**



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**Don't** tell the other fellow how many batteries you are using and what make.

**The other fellow** may buck you, and all he is fishing for is information.

**Don't** close contracts for 1910 until you hear **our** proposition.

**We** know how to protect you and will help you to **make** money.

**Don't** forget we guarantee every **X CELL**.

We ship fresh goods on the day your order is received, so you need not handle imported shelf worn batteries which may have been knocking all over the country for months.

**We** don't tie you up to **any** contract.

**Buy** as long as you are pleased at lowest price.

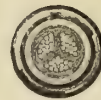
Give Canadian Enterprise a Chance.

**Electrical Specialties, Limited**  
Toronto

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Copper or  
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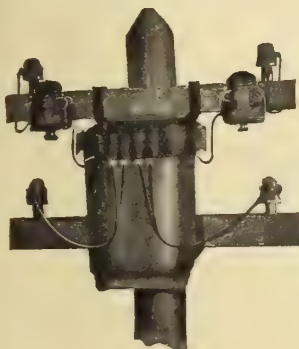


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and increase your receipts by using

**“Moloney”**

High Efficiency

**Transformers**

because they show remarkably low core losses. We have the best of good reasons for believing that these losses are lower than can be shown by any other transformer in the market. We back this belief with a guarantee that they will not exceed certain definitely specified amounts. The savings effected by these reduced losses should amount to about 20%—you save the purchase price every five years. Write for proof.

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St. Louis, Mo.

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Western Sales Office: 603 Union Bank Bldg.

Geo. A. Powell, Manager, Winnipeg

**Talk No. 4****MR. CONTRACTOR:—**

Present market has been conducive of a variety of prices on the regular No. 9386 Edison Key Sockets.

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The

**James Stuart Electric Co.**

Limited

88 Princess Street

- WINNIPEG, MAN.

**What kind of Meters are you going to order?**

Are you going to re-order more of the kind you are now using, or do you want something better?

The **Ferranti** is absolutely the best meter made. : : :

**We claim** for them absolute accuracy and durability : : :



Cyclometer Dial, Ferranti A. C. Watt-Hour Meter.

**The Ferranti Meter**

fills all requirements

There are a lot of technical reasons why our meters have gained a world-wide reputation, whenever exacting service is required under all conditions : : : :

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Manager

Winnipeg

Canadian Representative :

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West Toronto

# A Practical Demonstration

to your customer is

## The Best Argument

**Our Lamp Testing Watt  
Indicator**

**Sells Tungsten Lamps**

**Seeing is Believing**



**Attaches to Standard Edison  
Socket**

**Capacity 125 Watts**

**Range 100 to 120 Volts**

Method of Using the Lamp  
Testing Watt Indicator.

**Furnished in Neat Soft Leather Case for Pocket Use**

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# Canadian General Electric Co.

**Head Office : Toronto**

**Limited**

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**Halifax**

**Ottawa**

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# Tungsten Economy Diffusers

The Ideal Illuminant  
for Offices, Stores and Public Buildings



26 in. Tungsten Economy Diffuser  
for Store Lighting.

Made in 5 and 6 Light Styles and in Ornamental Types

The Especial advantages are

Low Operating Cost  
Ornamental Appearance

Wide Range of Capacity  
Excellent Diffusion

These Diffusers have recently been installed in a number of large Department Stores and Office Buildings throughout the Dominion with most satisfactory results.

Descriptive Bulletin and Prices upon request.

## Canadian General Electric Co.

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# Electric Hoists

- On Hand -

Owing to the failure of one of our customers due to the financial depression, we have on hand two Electric Hoists as follows:

1 double drum electric slope hoist having drums 60 inches diameter by 38 inches face arranged tandem. Capacity 8000 lbs. at speed of 350 feet per minute on a 35° slope, equipped with 75 h.p. type F. alternating current motor, 440 volts, mounted on same frame and having the necessary controller and resistances, dial Level indicator for each drum.

1 double drum electric hoist for vertical shaft, drums 60 inches diameter by 38 inches face arranged parallel. Capacity 4000 lbs. at speed of 450 feet per minute, skips being operated in balance equipped with 60 h.p. type F. alternating current motor 440 volts mounted on same frame and having the necessary controller and resistances, dial Level indicator geared for 500 feet.

They are high class machines in every respect and will be sold at a low figure

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Sales Offices:

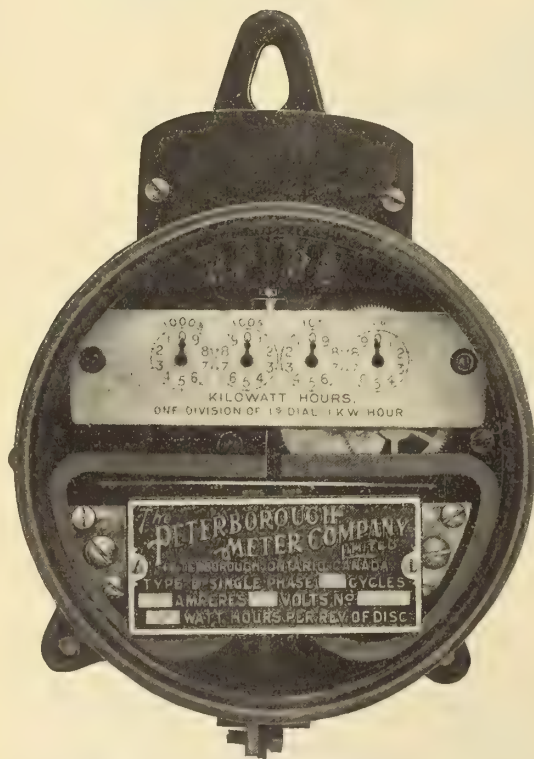
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Can Ship Immediately

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## Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent. overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

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Electrical Supplies

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# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY

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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 8

Toronto, October, 1909

No. 10

## A Separate Building for Electricity

It must constantly occur to the Toronto Exhibition visitor that about the most difficulty part of the whole Exhibition to locate is the electrical display. A part of the telephone apparatus, with other electrical displays, is found scattered broadcast over the Process Building. Dynamos, measuring instruments and tungsten lamps may be found somewhere in Machinery Hall. More telephones and a wireless telephone display occupy opposite sides of the Transportation Building. Wireless telegraphy is located, after two days' search, in the Manufacturers' Building. But the climax in our humiliation is reached when we discover an electric supply exhibit in the Woman's Building—cosily sandwiched in between the ceramics and the fancy work.

Electrical apparatus and electricity in its various forms constitute one of the most important factors in Canadian progress. There is no part of the whole Exhibition that bristles so with interest to both the expert and the uninitiated. It is questionable if any finer electrical display can be brought together anywhere in the world than would be found in a massed exhibit of Canadian products. And the pity of it is that the scattered exhibits, as placed at present, give the casual observer the impression of littleness and insignificance.

The solution lies, without doubt, in a separate building for electricity. The importance and extent of the industry justifies it. Under a proper roof of its own, re-

ceiving the attention it demands, the electrical exhibit would double and treble in volume and excellence. The actual inconvenience to the visitor, after all, is the smallest part of the whole matter. His electrical education is the important point to be considered, and we hope to see the matter taken up vigorously by the electrical associations and electrical men throughout Canada so that next year's Exhibition will find the electric display occupying the important place it is only waiting for a chance to fill.

## Twenty-Five Million Horse Power

It is almost impossible for our finite minds to gather in the meaning of this immense number. It recalls the futile efforts we made as boys at school to grasp the meaning of the distance from the earth to the sun, that illimitable ninety-five millions of miles. And yet this same 25,000,000 horse-power is what Mr. E. R. Young, D.L.S., Superintendent of Railway Lands, estimates Canada's waterfalls at, and then hastens to add that without doubt the estimate is very conservative. Just think what this means; more than eight times the power of Niagara; or, again, sufficient to operate more than 1,000 Montreal street railways; or, more than would be required by 1,000 Toronto Electric Light companies; or, if evenly distributed, enough to supply every man, woman and child in Canada to-day with between three and four horse-power.

This power, unfortunately, is not so evenly distributed as one could wish, though each province contributes a fair quota. Quebec, however, gets the lion's portion with 17,000,000, 9,000,000 of which is concentrated in one point, those wonderful Hamilton Falls estimated as capable of developing anywhere from three to five times as much power as Niagara. Ontario comes next with something over 3,000,000; British Columbia third with 2,000,000; Alberta fourth with something over 1,000,000. The Yukon, Saskatchewan, Manitoba and the Northwest Territories each contribute about half a million. New Brunswick gives 150,000; Nova Scotia, 50,000.

Plainly a problem in which Canada is vitally interested is economic long-distance transmission.

## Export of Canadian Power

Most Canadians have been taught to look upon Niagara power as something too immense ever to become exhausted, and have become inclined to consider very leniently the depredating activities of our neighbors to the south in acquiring whatever they could lay their hands on in the way of rights to develop and export large quantities of electrical energy. It is true that 3,000,000 horse-power represents a very large amount, and true also that rights have only been acquired by the various companies to develop between 500,000 and 600,000 horse-power, or, say 20 per cent. of the total amount; but it is also true, and this should give us pause, that only 27 per cent. of the total amount generated during the past year was used in Canada.

Assuming that the plan adopted by the Government of Ontario of attempting to supply power to the municipalities at a very cheap rate, works out as well as the sanguine ones expect, and assuming that the problem of long distance transmission without great loss reaches an early solution, so that the smaller towns of Ontario and the villages and farms, too, perhaps, can be supplied, we may soon learn to husband even the remnant of our 3,000,000 horse-power and wish we had been less prodigal in the presentation of exportation rights.

The cry has gone out in nearly every line of industrial



activity to guard more carefully what either seem or seemed, but a short decade ago, our almost immeasurable natural resources, our farm lands, our forests, our minerals; and the warning applies no less to our water powers, which, great as they are, will be all too small to control the activities of Canada's future millions, and may be required before any of us expect it, to the last horse-power.

### Legislation is Needed

In another column will be found a letter written by the City Electrician of Winnipeg dealing with the important question of proper inspection and approval of the various electrical materials on the Canadian markets, and especially insulated wires. In discussing the matter with Mr. H. F. Strickland, Chief Electrical Inspector of the Canadian Fire Underwriters' Association, Mr. Strickland expressed himself as entirely in accord with the ideas outlined by Mr. Cambridge. It would appear, however, that the chief danger arises from a small percentage of risks which this Association finds itself unable to control and not from any serious lack of inspection of material approved by the Association.

Municipal by-laws, with the exception of Winnipeg and possibly a few others, do not seek to exercise any control over the standard of electrical materials used in buildings within their jurisdiction. The hands of the Underwriters' Association under these circumstances are plainly more or less tied, inasmuch as there are certain fire insurance companies doing business in Canada, not members of the Underwriters' Association, that will accept risks even where glaring imperfections in the wiring, etc., are evident. It is true the Association ought to, and does, exercise a sort of moral influence tending to the general improvement of risks it does not control, but in the absence of any legal hold on its policyholders there is always the danger that too great a vigilance may be resented and customers may be lost.

It is plainly understood, of course, that Mr. Cambridge's letter is not intended to apply to Canadian manufacturers. These, almost without exception, measure up to a very high standard. This in itself is good reason why we should seek to kill the market for inferior, imported materials.

We believe that the first move in the solution should be taken by the municipalities. The Underwriters' Association will then probably be ready to take up some such idea as a testing laboratory or an electrical bureau of standards.

### Canadian Universities Well Equipped

Professor Rutherford in his address before the British Association paid a well-deserved tribute to the laboratories and laboratory equipment of our great universities. "After seeing the splendid home for physical sciences recently erected by the University of Toronto and the older but no less serviceable and admirably equipped laboratories of McGill University one cannot but feel that Canada has recognized in a striking manner the value attaching to teaching and research in physical science."

The question naturally arises, why do not our Canadian laboratories with their magnificent equipment, which is immeasurably in excess of that found in, for example, Cambridge—the home of scientific research—attract larger numbers of advanced students than at present are to be found here. So far we have failed to create the atmosphere surrounding the old-world educational centres. The fact seems to be, and we believe that

herein largely lies the secret, that graduate students are of necessity attracted more by scholarships which enable them to live, than by laboratories which enable them to work. A combination of the two, however, would surely be a sufficient attraction in favor of our home universities, and we hope those interested in university work will leave no stone unturned until, with a liberal supply of scholarships, we are able to attract graduate students in such numbers and of such quality as will justify the magnificent accommodation that has been provided.

### The Telephone Convention

The Independent Telephone Association met in convention in Toronto City Hall on Wednesday, September 8th. A more snappy and intelligent gathering of young men than some of these showed themselves to be, one could not wish to meet, though there were signs at certain stages of the proceedings that matters of rather minor importance were absorbing valuable time. A decided turn for the better, however, took place during the afternoon, matters of vital importance were discussed and decided upon which should insure the steady advance of the organization and if carried out with the vigor that one would expect from the new committee, will redound to the benefit of every telephone user in Canada.

There is no doubt that the crying need of the Association is organization—and organization of the high-frequency live-wire type. What the Independent Telephone System must have, if it hopes for speedy success, is a capable, well-paid organizer who will keep his finger on the very pulse of the four or five hundred independent companies already doing business in Canada; whose endeavor it will be to attune the, at present, more or less discordant policies of the various companies so that numbers may mean strength and not disorder. The organizer, too, would be of the greatest assistance in sections where companies are on the point of being formed. Much unnecessary duplication in the way of negotiations, legal advice, etc., would be avoided—troubles which often seem so great to the would-be organization that the project is abandoned or unfavorable conditions accepted.

The convention made a momentous move in passing the resolution which prohibits connection with the Bell Telephone lines. Looked at from the point of view of almost any individual independent telephone company, connection with the Bell lines, and particularly with the trunk lines of the Bell system, must undoubtedly be of great value. It is not to be expected that any immediate substitute for supplying the independent companies with long distance connections can be found. In discussing this resolution the convention took the broader ground of what would be for the greatest ultimate good of independent telephone service generally, and the vote indicated that the individuals present were ready to sacrifice immediate personal convenience to assist in the final triumph of their cause.

Whether this philanthropic attitude will characterize the members of companies whose representatives were unable to attend the convention, or whether this stand may not deter some prospective companies from organizing at all, whether, in short, this resolution from which so much is hoped in the matter of unifying the various interests, is not more or less of a menace to the unity that already exists is a question that will be largely answered by the tactfulness and vigilance with which the officers of the Association handle the situation.

In abandoning the policy of reciprocity with the Bell



Company, it is conceivable that the convention under-rated the public demand for long distance telephone service. In any case it would appear the part of wisdom to take immediate steps to supply a substitute for what the majority of telephone users consider, to say the least, a great convenience. Two courses suggest themselves—either induce the Government to expropriate the already existing lines and declare them public property, or, build long distance independent lines.

While on the surface the former method looks the easier and quicker of the two, it is more than likely that any government will hesitate some time before interfering with vested rights to the extent of forcing a long established and most important company to give up the very part of its machinery which would most cripple its operations. Then, too, it must be remembered that the existing lines are already loaded with business, and proper development of the telephone industry, either independent or Bell, would be impossible.

It would apparently be the better course for the independents to build their own lines, and do it quickly—for herein lies the strength of the Bell Telephone Company throughout Canada and the United States to-day.

### Recent Advances in Science

Extracts from address by Professor Sir J. J. Thomson, M.A., LL.D., D.Sc., F.R.S., president of the British Association for the Advancement of Science, at the recent meeting held in Winnipeg, Man.:

The president of the last meeting in Canada, that held in 1897, at Toronto, was Sir John Evans, one of those men who, like Boyle, Cavendish, Darwin, and Huggins, have from their own resources and without the aid derived from official positions or from the universities, made memorable contributions to science; such men form one of the characteristic features of British science. May we not hope that, as the knowledge of science and the interest taken in it increase, more of the large number of men of independent means in our country may be found working for the advancement of science, and thereby rendering services to the community no less valuable than the political, philanthropic, and social work at which many of them labor with so much zeal and success?

The period which has elapsed since the Association last met in Canada has been one of almost unparalleled activity in many branches of physics, and many new and unsuspected properties of matter and electricity have been discovered. The history of this period affords a remarkable illustration of the effect which may be produced by a single discovery; for it is, I think, to the discovery of the Rontgen rays that we owe the rapidity of the progress which has recently been made in physics.

We have already made considerable progress in the task of discovering what the structure of electricity is. We have known for some time that of one kind of electricity—the negative, and a very interesting one it is. We know that negative electricity is made up of units all of which are of the same kind; that these units are exceedingly small compared with even the smallest atom, for the mass of the unit is only 1/1700 part of the mass of an atom of hydrogen; that its radius is only  $10^{13}$  centimetre, and that these units, "corpuscles" as they have been called, can be obtained from all substances. The size of these corpuscles is on an altogether different scale from that of atoms; the volume of a corpuscle bears to that of the atom about the same relation as that of a speck of dust to the volume of this room. Under suitable conditions they move at enormous speeds, which approach in some instances the velocity of light.

We know a great deal about negative electricity; what do we know about positive electricity? Is positive electricity molecular in structure? Is it made up into units, each unit carrying a charge equal in magnitude though opposite in sign to that carried by a corpuscle? Does, or does not, this unit differ, in size and physical properties, very widely from the corpuscle? We know that by suitable processes we can get corpuscles out of any kind of matter, and that the corpuscles will be the same from whatever source they may be derived. Is a similar thing true for positive electricity?

For my own part, I think the evidence is in favor of the view that we can, although the nature of the unit of positive electricity makes the proof much more difficult than for the negative unit.

I have, for example, put into the exhausted vessel oxygen, argon, helium, the vapor of carbon tetrachloride, none of which contain hydrogen, and found the positive particles to be the same as when hydrogen was introduced.

The investigations made on the unit of positive electricity show that it is of quite a different kind from the unit of negative, the mass of the negative unit is exceedingly small compared with any atom, the only positive units that up to the present have been detected are quite comparable in mass with the mass of an atom of hydrogen; in fact, they seem equal to it.

How great is the supply of energy the sun lavishes upon us becomes clear when we consider that the heat received by the earth under a high sun and a clear sky is equivalent, according to the measurements of Langley, to about 7,000 horse-power per acre. Though our engineers have not yet discovered how to utilize this enormous supply of power, they will, I have not the slightest doubt, ultimately succeed in doing so; and when coal is exhausted and our water-power inadequate, it may be that this is the source from which we shall derive the energy necessary for the world's work. When that comes about, our centres of industrial activity may perhaps be transferred to the burning deserts of the Sahara, and the value of land determined by its suitability for the reception of traps to catch sunbeams.

I now pass to a very brief consideration of one of the most important and interesting advances ever made in physics, and in which Canada, as the place of the labors of Professors Rutherford and Soddy, has taken a conspicuous part. I mean the discovery and investigation of radio-activity. Radio-activity was brought to light by the Rontgen rays.

The radiation emitted by radio-active substances is of three types, known as a, b and c, rays. The a rays have been shown by Rutherford to be positively electrified atoms of helium, moving with speeds which reach up to about one-tenth of the velocity of light. The b rays are negatively electrified corpuscles, moving in some cases with very nearly the velocity of light itself, while the c rays are unelectrified, and are analogous to the Rontgen rays.

According to this theory, the radio-active elements are not permanent, but are gradually breaking up into elements of lower atomic weight; uranium, for example, is slowly breaking up, one of the products being radium, while radium breaks up into a radio-active gas called radium emanation, the emanation into another radio-active substance, and so on, and that the radiations are a kind of swan's song emitted by the atoms when they pass from one form to another; that, for example, it is when a radium atom breaks up and an atom of the emanation appears that the rays which constitute the radio-activity are produced.





Observation Car recently placed in commission by the Canadian Pacific Railway Company.

## New Canadian Pacific Railway Observation Cars

**Palace Luxury on Wheels—One attached to every Trans-continental Train — Stone System of Electric Lighting**

The Canadian Pacific Railway Company recently placed in service 22 combined compartment sleeping and observation cars, one of which will be attached to the rear end of all through transcontinental trains.

These cars are lighted throughout by electric lamps, the generating apparatus being a dynamo of the "Stone" type, which consists of a 24-volt, 40-ampere, bipolar dynamo driven by a belt running over a driving pulley attached to inside axle of rear truck, and two sets of storage batteries of 320 ampere hour capacity.

The interior arrangement of the cars is illustrated by floor plan, fig. 1, which also shows the arrangement of the lighting fixtures. The fixtures, finished in oxy-dized brass to harmonize with the remainder of the metal work of the cars, are of special design to conform to the interior decoration. The use of shades has been dispensed with, on account of constant breakage due to continual cleaning and vibration to which they are exposed in such service. To prevent glare on passengers' eyes, consequent to the absence of shades, all incandescent lamps are acid-frosted, and to prevent loss of light by lack of a reflector, bottoms of socket husks are designed with reflecting surface sufficient to give proper distribution of light. All lamps are kept high and divided into many small units, so as to give as soft and uniform an illumination as possible. For control purposes by car attendant, lights are divided into two circuits, i.e., a half light or all night circuit and a full light circuit. On the former are included lamps on outside platforms, in corridors, lavatories, staterooms, and part of smoking room fixtures. In addition, circuit switches are provided inside staterooms, so that passengers may throw lights on or off as desired. Two smaller independent circuits are also installed to allow buffet attendant to control lamps in his compartment, and the fans placed at either end of the main observation room.

Tungsten lamps of an efficiency of  $1\frac{1}{2}$  watts per c.p. and varying in strength from 8 to 16 c.p., are used throughout. Each lower berth in the staterooms is provided with a lamp at the outside end of each seat. The appearance of this berth fixture is novel and differs from any heretofore used, being designed by the company's engineer. The fixture consists of a main casting set on a wood panel carrying on its back a reflector, lamp and

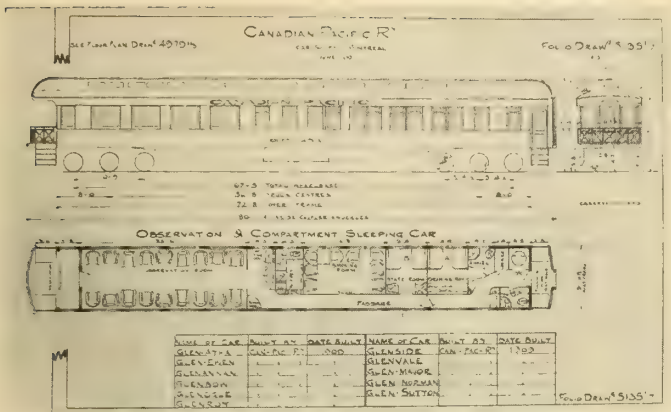
miniature flush push type switch, with a half opalescent glass shade projecting from the front of the fixture, covering the lamp and giving a soft diffused light of sufficient intensity to permit the reading of fine print.

The most prominent feature in connection with the generating apparatus is the lack of the usual more or less complicated regulator. In order to simplify the apparatus, the electrical efficiency of equipment has been to a certain extent sacrificed, low cost of maintenance and reliability being considered more essential than high efficiency in railway car lighting. With the "Stone" equipment a mechanical method is used for the regulation of the voltage at various speeds above predetermined value. The dynamo is specially hung as shown in fig. 2. It is attached by a loose hinge to an adjustable link, which is held in position by two nuts on a tension screw. The dynamo is thus free to swing towards, or away from, the driving pulley on the axle. The suspending link and belt are adjusted so that the latter draws the dynamo out of the position in which it would naturally hang, thus putting a definite tension on



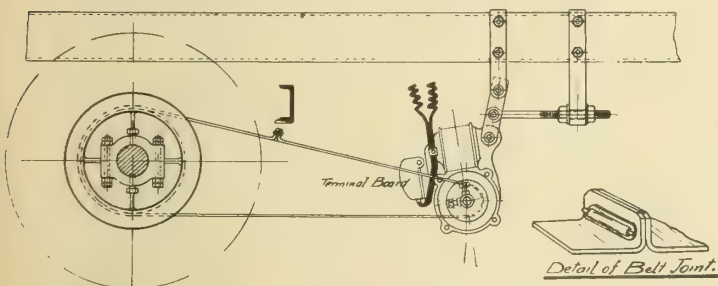
Interior of C.P.R. Observation Car.





the belt just sufficient to absorb power equivalent to the electrical power required. Thus, when the pull on the belt (owing to the increase in the speed) exceeds the weight on the belt due to the one-sided suspension of the dynamo, the latter will be automatically drawn towards the driving pulley on the axle, thus allowing the belt to slip, while the armature will continue to revolve at its normal speed. The belt tension can be regulated to suit requirements by means of the tension screw.

This system uses two batteries, and the switching is so arranged that one battery serves to regulate the voltage at the lamp terminals, whilst the other receives a small charge. When the coach runs in the opposite direction, the connections of the batteries are automatically reversed, the battery last charged becomes the regulating battery and the other one receives the charge. The batteries are placed in two boxes, one on either side of the car. Boxes are provided with half hinged doors to permit of easy inspection of cells at terminals. This, in conjunction with a float on each cell, permits inspectors at terminals to note height of electrolyte in cells. In



addition, by means of an ebonite tube projecting through the cover of each cell, the test for the specific gravity of the cells is easily made. By attaching a small syphon with a rubber tube connection to the ebonite tube and by squeezing and releasing the rubber ball of the syphon tube the acid rises in the tube containing a hydrometer. Should gravities be found low, the inspector has only to regulate position of dynamo for greater output, by adjustment of screw A, as shown in fig. 2.

All wiring of cars is placed, so far as possible, with a view to being easily accessible. Mains are carried on outside of top of car in wood moulding suitably protected by metal covering. Standard double-braided rubber covered wire is used throughout, and where concealed is protected by circular loom.

The belt used is a three-inch, four-ply, copper riveted one, and is made of canvas impregnated with balata. The average life of a belt is about a year, or 60,000 miles.

When necessary, belts are protected by belt cases which, though lengthening the life of belts by protecting them from sand or grit in summer and ice in winter, are not always easy to install nor to be advocated, since they render frequent inspection of belts difficult.

Through the regulation of voltage being almost perfect, the life obtained with the tungsten lamps used is most satisfactory, their life averaging over 1,000 hours. No flicker in lighting is perceptible when the generator cuts into or out of service as the train starts or stops. Needless to mention, the convenience of the lighting in these cars adds greatly to their popularity with the travelling public.

## Is Canada Getting Inferior Grades of Insulated Wire?

We print below a letter which is being addressed by Mr. F. A. Cambridge, City Electrician for Winnipeg, to the various insulated wire manufacturers of Canada. Our comment on the matter involved will be found in the editorial columns.

Gentlemen,—There is being placed on the local market, rubber-covered wire manufactured by the Lowell Insulated Wire Company, of Lowell, Mass.

This wire is on the approved list of the American Underwriters, but does not bear the factory inspection labels. In this latter respect your own product shows no evidence of factory inspection, nor does the wire product of any Canadian factory give any evidence of such inspection.

If such were the case we might be able to refuse sanction of the use of wire not having the factory inspection labels. We are afraid that some inferior grades of wire are being dumped on the Canadian market, and as this department has not the proper facilities for making tests of the insulation of wires, it is unable to satisfactorily determine the character of these products.

Kindly advise me what you are prepared to do in this matter and oblige.

Yours truly,  
F. A. Cambridge,  
City Electrician.

## Northumberland-Durham Power Company

The Northumberland-Durham Power Company, lessee of the whole of Healey Falls power from the Dominion Government, and the Culverwell syndicate, owning certain Trent river powers, north of Trenton and at Campbellford, have completed a contract with a leading Montreal financial corporation for the underwriting of two and a half million dollars bonds for the development of these powers.

The deal was consummated by Mr. John Alexander Culverwell, of Port Hope, managing director of the company and of the syndicate, assisted by R. J. McLaughlin, K.C., of Toronto and Lindsay. Power will be transmitted to Belleville and the cement mills, Deseronto, Napanee and Kingston, also west to Port Hope and Cobourg, and also north to Havelock, Norwood and Blairton mining districts.

Eighteen municipal councils have officially endorsed the Government lease to the company, which has been organized by the leading manufacturers and business men of the district.

These powers will be developed on the dams being built by the Dominion Government for the Trent Canal.

## International Units and Standards

The report of the Deputy Minister of Inland Revenue on the International Conference on Electrical Units and Standards is just to hand. The conference met on the invitation of the British Government in London in October, 1908, "to consider and advise as to the steps that should be taken to bring about the agreement in the definition of electrical units which form the basis of legislation in different countries."

Twenty-five different countries were represented, the delegates including only scientists of international reputation, such as Raleigh, Warburg, Egoroff, Arrhenius, Lippman, Carhart, Edler von Lang, Benoit, J. J. Thomson, and Glazebrook. Canada's representative at this conference was Ormund Higman, chief electrical engineer to the Dominion Government.

As a result of its deliberations the conference adopted the following standards for the ohm, the volt, the ampere, the watt, and the Weston normal cell:

1. The international ohm is the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grammes in mass, of a constant cross sectional area and of a length of 106.300 centimetres.

2. The international ampere is the unvarying electric current which when passed through a 15 to 20 per cent. solution of silver nitrate in water, deposits silver at the rate of 0.00111800 of a gramme per second.

3. The international volt is the electrical pressure which, when steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampere.

4. The international watt is the energy expended per second by an unvarying electric current of one international ampere under an electric pressure of one international volt.

5. The Weston normal cell, set up in accordance with fixed specifications (given), is taken at 20 degrees C. as having an E.M.F. of 1.0184 volts.

## Electric Meter Inspection

The Department of Inland Revenue has just issued a report on the results of the inspection of electric meters together with a condensed financial statement of revenue and expenditure for the past year. A total of 39,001 meters were inspected, of which 15,712, or 40 per cent., were absolutely correct. Only 125 meters, or about one-third of one per cent., were rejected as falling beyond the standard allowed by law. The statements follow:

The financial statement in connection with Government electricity inspections, which are conducted largely by the same staff is as follows:

YEARS.	GAS AND ELECTRIC LIGHT.	
	Revenue.	Expenditure.
	\$ cts.	\$ cts.
*1899-1900.....	35,523 50	26,424 48
*1900-01.....	37,536 57	28,247 20
1901-02.....	43,663 05	33,328 48
1902-03.....	49,054 55	36,006 47
1903-04.....	50,218 75	33,426 15
1904-05.....	62,561 37	34,774 02
1905-06.....	76,539 00	38,917 48
1906-07 (nine months).....	57,868 18	30,793 84
1907-08.....	86,552 20	48,831 75
1908-09.....	92,450 21	54,018 71

\* Exclusive of cost of standard instruments.

The following statement gives the number of electric meters verified and rejected for the fiscal year ended March 31, 1909, by the Department of Inland Revenues:

Districts.	Presented for verification.	Verified as coming within the error tolerated by law.			Rejected.		
		Correct.	Fast.	Slow.	Unsound.	Fast.	Slow.
Belleville.....	1,174	665	199	310	.....	.....	.....
Hamilton.....	2,561	922	410	1,228	.....	1	.....
London.....	1,563	769	423	360	.....	8	2
Ottawa.....	3,990	978	1,502	1,475	.....	34	1
Toronto.....	6,654	2,032	2,788	1,796	.....	19	19
Montreal.....	7,524	2,556	4,746	214	.....	4	4
Quebec.....	643	378	202	63	.....	.....	.....
Sherbrooke.....	437	215	124	97	.....	.....	.....
St. Hyacinthe.....	391	98	203	89	.....	1	.....
Three Rivers.....	260	155	52	53	.....	.....	.....
St. John.....	1,152	548	316	285	.....	3	.....
Halifax.....	1,751	1,711	11	10	.....	6	6
Charlottetown.....	334	135	118	72	.....	6	3
Winnipeg.....	2,910	1,854	420	636	.....	.....	.....
Calgary.....	2,151	893	559	699	.....	.....	.....
Vancouver.....	3,797	663	1,437	1,697	.....	.....	.....
Victoria.....	1,709	1,139	263	307	.....	.....	.....
Grand totals.....	39,001	15,712	13,773	9,391	48	43	34

On July 1, 1909, there were brought into effect new schedules of fees for the inspection of meters, for gas and electricity, which will tend to decrease the revenue from these sources. If found practicable future reductions may be made which will probably result in more nearly equalizing the revenue and expenditure in connection with these services.

## Electric Smelting of Iron Ores

As a sequence to the reports on electric smelting of iron ores, published in 1904, 1906 and 1907, the Mines Branch of the Department of Mines of Canada has just issued the results of "An Investigation of an Electric Shaft Furnace" in operation at Domnarfvet, Sweden. The investigation was made by Dr. Eugene Haanel, in December, 1908, on the invitation of the inventors, and the results given represent the latest developments of the electric smelting of iron ores. The report may be obtained on application to Dr. Eugene Haanel, Director of Mines, Department of Mines of Canada, Ottawa.

## Export of Canadian Electrical Energy

The following statement gives the amount of electrical energy generated for export and consumption in Canada for the fiscal year ending March 31, 1909; also the approximate generating capacity at that date of the exporting Canadian companies:

Name of Company	Generating Capacity in k.w.h.	Total A m't Generated in k. w. h.	Generated for Export in k. w. h.	Gener't'd for Canadian Consumpt'n in k. w. h.
Canadian Niagara Power Co.	300,000,000	227,333,000	221,927,240	5,405,760
Electrical Development Co. of Ontario.....	300,000,000	90,195,000	4,680,500	85,514,500
Ontario Power Co. of Niagara Falls.....	450,000,000	175,984,362	131,833,784	44,150,580
Maine and New Brunswick Electric Power Co. ....	.....	845,704	841,764	3,940



# Electrical Features of the Toronto Exhibition

Attractive Exhibits of Several Leading Firms—Toronto Electric Light Company make an Interesting Display—Electrical Fixtures Prominent

Electricity and success become synonymous terms when used in connection with the recent Canadian National Exhibition held at Toronto from August 28th to Sept. 10th. This year's Fair was eventful in the history of the Association, both in point of attendance and in the general attractiveness of the exhibits, and it was noticeable that manufacturers were more than ever awake to the value of electric lighting



Panel in Toronto Electric Light Company's Exhibit—Designed and Erected by Death & Watson.

in creating an effective display, with the result that both the grounds and buildings were a veritable blaze of light.

**Toronto Electric Light**—Practically all machinery and appliances in the different buildings were motor driven from current supplied by the Toronto Electric Light Company, who also had the contract for lighting the numerous arc lamps on the grounds. In addition, realizing the opportunities for obtaining a larger domestic load, through the medium of these new appliances, this company made a truly wonderful display at the Fair. Their spacious booth was prominently situated in the Process Building and was furnished throughout in white. On the walls of the booth were numerous original mottos, advocating the freer use of electricity, and a groove letter panel sign, reading "Use Toronto Electric Service," stood out prominently. A block letter, facer sign reading "Toronto Electric Light Company Electric Exhibit" was also noticeably arranged around the exterior of the exhibit. These signs were designed and exhibited by Death & Watson, of Toronto, which company also designed and erected on the roof of the stand a handsome panel that was easily the most attractive feature of the Process Building.

This panel was thirteen feet in width by fourteen feet in height, and contained about 750 lamps of various colors. In the centre of the panel, in four-foot letters, was a monogram reading "T. E. L. C." in white, red, blue and amber. Surrounding the monogram was a wreath of holly leaves with red berries. The leaves were green and had a wavy effect as though rustled by the wind, while the berries burned steadily. At each side of the panel was an amber torch fourteen feet in height, crowned by a red and amber flame. Around the torch a green snake was continually twining itself. When the snake had mounted to the full height of the torch, a sunburst of lamps shaded from deep ruby to canary, occupying the central part of the panel, suddenly burst into light, giving a pleasing finishing touch to a cleverly designed panel.

The sign was operated by two flashers, one operated at a high speed, giving a waving effect to the leaves, while the snake and sunburst were worked from a drum flasher similar to that used in operating writing signs.

This enterprising company offered to demonstrate the wares of all electrical manufacturers, and, as a result, their display contained an exceedingly varied collection of electrical specialties and novelties. These were in charge of Mr. Creed and an efficient staff of demonstrators, including several ladies.

Included in this exhibit were motors from the Eastman Machine Company, Limited; Canadian General Electric; Langdon-Davies; Motors, Limited; Canadian Westinghouse Company, etc.; the Shaler Electric vulcanizer for automobile work, for which John Millen & Sons, of Montreal and Toronto, are Canadian agents; the 1900 washing machines; Vulcan Electric Company, of Chicago, soldering tools, can capping tools, branding appliances and a Vulcan electrocurl; the Sturtevant ready-to-run ventilating set; the Duntley pneumatic cleaner with vibrator attachment for massaging; exhaust fans manufactured by the Canadian General Electric Company; glue pots, made by the Canadian Westinghouse Company; electric cigar lighter and shoe iron, made by the Simplex Electric Company, of Cambridge, Mass.; coffee grinders, made by the A. D. Fisher Company, of Toronto; a wax heater, by the Simplex Company; a speed changer for supplying various speeds for drill presses, supplied by A. D. Fisher Company, of Toronto; a Burroughs adding machine, operated by a 10 horse-power motor; a vacuum cleaner and luminous radiators, supplied by the Canadian General and Westinghouse Companies; sewing machine motors, supplied by the Canadian General Electric Company; cooking apparatus, heaters, toasters, etc., supplied by the Simplex Company, the Westinghouse Company, and the Canadian General Electric Company; a Canadian General Electric coffee percolator; a dental sterilizer, heating pad, waffle iron, and electric tea kettle, supplied by the Simplex Company; a Westinghouse combination boiler and toaster; shaving mugs and water heater, soldering pot, and also a National Cash Register electrically operated.

The booth was lighted throughout with tungsten lamps equipped with holophane shades, and made a particularly brilliant display.

**Electrical Specialties, Limited, Toronto**, made an excellent display of their well known and popular line of X cells. In charge of the exhibit was Mr. Chas. Bradfield, who has



Exhibit of Electrical Specialties, Limited, Toronto.



recently taken hold of the sales department of this firm. The company exhibited a full line of motor boat and automobile supplies, coils and spark plugs, among which latter was included the well known "red head" plug, for which they have the agency. It is their intention, we understand, shortly to commence the manufacture of coils, spark plugs and other motor supplies at their Toronto factory.

Mr. Alfred Landau, manager of Electrical Specialties, Limited, announces that owing to increasing business his firm has opened an office at 44 St. Antoine street, Montreal, which will be in charge of Mr. Irving Smith, formerly vice-president of the R. E. T. Pringle Company.

The Governments of Manitoba, Alberta and Saskatchewan have recently placed substantial orders for X cell batteries, after exhaustive tests by their engineers.

The new type of X cell "Model 1910" with red label and red sealing wax is proving very popular with the dealers.

**Canadian Westinghouse Company**—Immediately opposite the northern entrance to the Industrial Building the Canadian Westinghouse Company's exhibit was located, and was indeed a model in every detail. Mr. W. H. Aunger had charge

tiveness of the exhibit. Especially interesting was the board of the S.S. Mauritania, which was erected and equipped by the Ferranti Company in the remarkably short space of two days.

**The Sterling Electric Company**—An attractive exhibit in Machinery Hall was that of the Sterling Electric Supply Company, of Toronto. All through the Fair Mr. Greene and his assistants made demonstrations of the Just tungsten lamp, for which the company is agent. By means of a lamp testing wattmeter, a product of the Electrical Accessories Company, New York, a practical test of the current consumption of this tungsten lamp in comparison with carbon varieties was made possible.

Another interesting feature in this booth was the exhibit of a new cartridge or sectional coil for jump spark and "make and break" service. This firm controls the agency for the makers, the Cartridge Coil Company, of Lafayette, Indiana.

A Federal vacuum cleaner, a compact and portable machine, equipped with a  $\frac{1}{4}$ -h.p. motor and suitable for domestic service, attracted considerable attention. In addition,



Exhibit of Ferranti, Limited, at Canadian National Exhibition, Toronto.

of the heating apparatus and general display, while Messrs. J. A. McKay and L. W. Morden looked after the nernst lamp department.

The display included an extensive line of domestic utensils electrically operated, this department being made a feature of the exhibit. Lady demonstrators were present all through the Exhibition, and the large number of inquiries and investigations made by visitors should be a fair criterion of the universal interest that is at present taken in these electrical conveniences. A motor-driven sewing machine, disc heaters, electric toasters, electric renovators, glue pots, vacuum cleaners, washing machines and small heaters were all in evidence. Transformers, motors, nernst lamps, and a variety of desk fans as manufactured by this company were also on display.

**Ferranti Meters**—The exhibit of Ferranti meters in Machinery Hall constituted one of the most creditable displays at the Fair. On either side of the booth stood two large panel boards of marble, which contained the complete lines manufactured by this British Company, all wired for demonstration purposes. Mr. Schofield, the company's English expert, assisted Mr. Geo. C. Rogers, the Canadian representative, in explaining to the visitors the interesting features of these meters. Several wall pictures, illustrative of various switchboards equipped by this company, added to the attrac-

tiveness of the exhibit. Especially interesting was the board of the S.S. Mauritania, which was erected and equipped by the Ferranti Company in the remarkably short space of two days.

**Mechanics' Supply Company**—The display of telephones, switchboards and parts shown by the Mechanics' Supply Company, of Quebec City, in the handsome decorated booth in the Industrial Building, was a revelation to most telephone engineers and visitors, and showed what progress has been recently made in the improvement of independent telephone equipment.

The great feature about the telephones and switchboards offered by this company was their simplicity of construction and ease of operation. They are especially built to be installed by people who have very little knowledge of telephonology, and when installed may be kept in perfect working order without the aid of an expert engineer. The drops of their unitype switchboards differ from all others on the market, and are interchangeable without the use of any tools, and should lightning damage any of the drop coils the operator can exchange new drops for the burnt ones, and thereby keep the switch, without calling in the aid of the trouble or repair man.

The goods shown by the Mechanics' Supply Company are manufactured by the Sumter Telephone Manufacturing Com-



pany, of Sumter, S.C., who own and operate the largest telephone plant in the South, and for whom they are sole Canadian agents.

**The Stromberg-Carlson Telephone Manufacturing Company** made an attractive exhibit of telephone apparatus and equipment in the Industrial Building.

Among the displays in this booth were a new type of automatic push button intercommunicating telephones for warehouses, etc. A special feature of this portion of the exhibit was the new flush type instruments for residence use, also a specially designed waterproof iron telephone for use in mines and on railway systems. These were shown in both central energy and generator call types.

This firm also displayed a central energy private branch exchange switchboard, lamp line signal type, equipped and in operation; together with their various types of central energy telephones; generator call telephones for rural telephone systems, and a 150-line generator call switchboard equipped with their new self-restoring tubular line drop and automatically

**Norton-System Telephone Company**—The exhibit of the Norton-System Telephone Company, Limited, of Toronto, in the industrial section of the Exhibition, was a centre of interest during the entire Fair. The company exhibited a novelty advertising switchboard for hotel purposes, containing space for inserting local advertisement.

The Norton-System exhibit for apartment house service was very complete and serviceable. A vestibule set that was much admired provides a means by which a visitor, finding the doors locked, can call the person he desires, who can admit his visitor by means of an electric door spring. There were also janitors' and tradesmen's telephones connected in on different switchboards.

The company also exhibited Blake insulated staples and cleats; the Couch automatic warehouse and factory phone, with locked button effect; an especially serviceable railway annunciator; Gill selector for telegraph call; an automatic call for train despatch, as well as full lines of train despatching telephones; the Ericsson all-metal phone (stamped com-



Exhibit of Stromberg-Carlson Telephone Mfg. Co. at Canadian National Exhibition, Toronto.

restored clearing-out signal. This latter board was sold to the Brussels, Morris and Grey Telephone System, of which blue prints, showing the construction, were shown.

A new glass mouthpiece, replacing the rubber mouthpiece, together with an equivoise adjustable arm, were also shown.

Mr. George J. Beattie, Canadian representative, distributed a souvenir in the shape of a folder having a map of the Exhibition Grounds on one side, and a picture of their last year's exhibit, on the other side.

**Dominion Telephone Manufacturing Company**—A visit to the new Transportation Building at the Canadian National Exhibition revealed only one exhibit which fell within the scope of this paper, namely, that of the Dominion Telephone Manufacturing Company, Limited, of Waterford, Ont. The display was in charge of Messrs. W. O. Rhode and E. F. McCord, and much credit is due to this newly-formed company for their splendid showing. On exhibition was a 200-line central office board, a general line of magneto equipment, and a 50-line board. The company also exhibited a 200-line lighting arrester or distribution rack, an adjustable radio arm for connecting up desk set, and a variety of unassembled parts used in making up their telephone sets.

pletely from steel and fireproof); the Ericsson novelty desk phone with a swing arm, and a combination transmitter and receiver. They had also on display a 200-line switchboard complete in every respect.

**Northern Electric & Manufacturing Company**—This exhibit was in charge of Messrs. C. W. Stokes, P. M. Chamberlin, F. E. Ritchie and B. L. Baulch, representatives of the company. One of the chief features of the exhibit was the new type of magneto switchboard with combined self-restoring jack and signal, to which was connected several lines showing the farmers' rural telephone and party lines equipped with push button, giving individual ringing to central. Used in conjunction with the board was the company's new interrupter, which eliminates all ringing by hand on the switchboard, and means that the operator can handle twice as many lines as is possible under ordinary conditions.

The company showed several 10-line switchboards suitable for use in small exchanges; a lamp signal board for private branch exchange; a complete line of magneto and central energy apparatus, and intercommunicating telephones for large warehouses and residences; railway composite sets, by the use of which one can telegraph and telephone over the



same line simultaneously; street railway telephones, as adopted by the Toronto Street Railway, and used on all the important intersections of the road; police patrol system as adopted by the city of Toronto and installed last year; and a complete line of fire alarm apparatus as used by the city of Toronto and several other cities throughout the Dominion.

The company also exhibited a complete line of Condit oil switches and circuit breakers, enclosed and flaming arc lamps, Western Electric Motors, and other electrical lines for which they are Canadian agents.

**Canadian Independent Telephone Company**—The exhibit of the Canadian Independent Telephone Company at the Toronto Exhibition was creditable in every detail, showing to advantage their well known line of goods. In charge of the booth were Mr. Peter Fox and Mr. H. L. Varcoe.

Everything in telephone accessories was exhibited by the company, from linemen's tools to telephone wire and all the various construction materials. On view also was a handsome 100-line switchboard with lamp signal equipment, connected for test purposes to twenty telephones on the walls of the

were employed and demonstrated to advantage by the company's experts.

**Jones & Moore Electric Company**—The well known electric manufacturing firm of Jones & Moore, Toronto, were, as usual, to the fore in their display at the Canadian National Exhibition. Their exhibit was centrally located in the Machinery Building and an attractive decorative effect was obtained by the use of variously colored electric bulbs surrounding their entire exhibit. The booth was in charge of Mr. Jones. The display included their direct current, alternating current, and alternating and direct current motors. A machine that came in for a large share of attention was a single-phase, self-starting, alternating motor. This motor is started under full load with brush contacts, and when synchronism is effected the brushes are automatically cut off and the machine operates as an induction motor. Other machines exhibited included a line of induction motors from 1 h.p. to 40 h.p., direct current motors from 1 h.p. to 80 h.p., and both bi-polar and multi-polar machines.

This enterprising firm combined with their exhibit a novel



Exhibit of Canadian Independent Telephone Co. at Canadian National Exhibition, Toronto.

booth. This board was sold to the Plum Hollow Telephone Company.

Another 50-line board, rigged to full capacity, was on display, and will be used by the Leeds & Grenville Telephone Company.

Other interesting lines shown by this company comprised a large line of telephone arresters, a new self-contained hook, and an assortment of transmitters and telephone parts. During the Fair the Canadian Independent Company distributed a "lucky pocket piece" with a picture of their ordinary type subscribers' phone on one side and a reminder regarding these phones on the opposite side.

**The Collier Cunningham Company**, of Peterborough, had their exhibit located in the industrial section, and showed a variety of electrical specialties, consisting of cooking appliances, such as toasters, electric heaters, electric radiators and various sizes in sad irons.

**Jones Under-Feed Stoker Company**—The Jones under-feed stokers were again prominently identified with the operation of the steam equipment for the Canadian National Exhibition. In Machinery Hall several under-feed stokers of this type

method of demonstrating one of the practical uses to which electric power is adapted, and at the same time gave their visitors a souvenir of their trip to the Exhibition. This took the form of a motor arranged to operate a shoe-polishing outfit.

This company, in addition, supplied a large number of the induction motors in operation in the Process Building during the Fair.

**The Standard Glass Company**, of Toronto, occupied a booth in the industrial section and had on display an attractive assortment of art glass domes and a variety of electrical fixtures.

**The British Aluminum Company**, represented by Messrs. Parke & Keith, Toronto, made a well assorted display of aluminum wire for electric transmission purposes, arresters, etc. The exhibit was located in Machinery Hall and came in for a large share of attention.

**McDonald & Willson**—An effective exhibit in the industrial section was made by the McDonald & Willson Company, Toronto, who displayed a well varied line of electrical fixtures. Their booth was handsomely finished in squared Georgia pine, panelled wall with burlap finish, and buff panelled ceiling.



An exhibit of den specialties, including a bracket of the Elizabethan type and hammered brass effect with removable mica shade, elicited much admiration. A verde, antique, 4-light library fixture and a hammered brass library fixture were also favorably commented upon. In art glass domes this company showed a large assortment. Two in colonial style and one of Grecian pattern were particularly rich. The booth was in charge of Mr. E. Clapp.

**The Benjamin Electric Manufacturing Company** exhibited a fine display of tungsten lamps in the booth of the Northern Electric & Manufacturing Company. This firm was also largely responsible for the attractive appearance of many other exhibits that were using the fixtures and other apparatus of this company.

**The Jas. L. Morrison Brass Company, of Toronto,** exhibited some excellently designed electric fixture specialties. Particularly noticeable was a five-foot piano lamp of green, gold tinted glass, finished in hammered brass and with a dome of elaborate colonial style. An ornamental grate with fire-col-

**Keith & Fitzsimmons**—The exhibit of Keith & Fitzsimmons, of Toronto, in the industrial section of the Canadian National Exhibition, made a particularly effective display and was much admired. Their booth was attractively finished in oak with a dark red background, and several originally designed hammered brass electroliers and semi-ceiling fixtures for dining and living rooms were exhibited. The company also showed some domes of excellent workmanship finished in cast brass that were worthy of special notice.

**The Winnipeg Municipal Display**—The panoramic view of the power plant being installed by the city of Winnipeg to supply cheap power to its citizens gave the Exhibition visitor a clearer idea of modern hydraulics and electrical operations than volumes of literature on the subject could accomplish. It is claimed that a possible 100,000 h.p. can be obtained at this point, but as this amount is far in excess of what the city of Winnipeg and the outlying country will require for many years, provision is made for a development of only about 60,000. The immediate requirements of the city will probably not exceed 15,000 or 20,000 h.p., and machinery is only



Exhibit of The James Morrison Brass Mfg. Co. at Canadian National Exhibition, Toronto.

ored coal-shaped glass, enclosed by a square mantel-rail of brass, created a pleasing and cosy effect. A noticeably odd drawing-room electrolier was a four-light fixture with arms consisting of battle-axes carrying a chain border. The exhibit also included a line of domes, portable lamps, etc.

A novelty sign on the booth which attracted much attention consisted of a brass hand holding a flash of lightning, the effect being cleverly produced by the use of a series of small lamps.

**The 1900 Washer Company**—In the Manufacturers' Annex were demonstrated to the housewife the feasibility and ease with which electricity can be employed in operating a washing machine, several such washers being shown in operation, driven by small alternating current motors. The booth was attractively arranged and lighted with nernst lamps.

**The United Wireless Telegraph** display successfully maintained communication between the extreme points of the Manufacturers' Building and courteously demonstrated the value of this wonderful invention by sending messages free of charge from end to end of the building. The uninterrupted operation of the apparatus during the whole period of the Fair sufficiently demonstrated the reliability of the instruments used.

being at present installed to develop that amount. This can be increased to 60,000 h.p. by the simple addition of units as the demand grows. The claim is made also, that power will be delivered to the Winnipeg consumer at less than \$20 per h.p.

**The Weber Gas Engine Company, of Kansas City,** made an exhibit in Machinery Hall of a 65-h.p. anthracite gas producer unit, and also included one of their well known grate bars.

The exhibition of this producer was particularly interesting in view of the fact that a Canadian Weber Company was recently organized and will soon be manufacturing these units at Barrie, Ont., for the Canadian market. The Weber producer called forth many favorable remarks on its generally neat and compact appearance.

**The Dudbridge Iron Works, of Stroud Glos, Eng.,** had an attractive exhibit of gas and oil engines. The claim of these engines for efficiency and low cost of operation is apparently well founded, as tests have proven that the consumption of petroleum is less than three-quarters of a pint per B.H.P. per hour. The Canadian agency is held by Mr. A. K. Wright, 32 Church street, Toronto.



# Canadian Independent Telephone Association

**Members in Annual Convention Read Papers, Review the Situation and Pass Some Important Resolutions — Dr. Doan Elected President**

The fourth annual convention of the Canadian Independent Telephone Association met in the City Hall, Toronto, at 10 a.m. September 8th, 1909.

The vice-president, W. Doan, M.D., of Harrietsville, Ont., presided, and his opening remarks were: "It is somewhat of a surprise that I find myself in the presiding chair to-day. I was not aware of the fact that our president, Dr. Demers, was ill and unable to be with us, until I reached the city last night. However, from the communication that our secretary, Mr. Wilson, has just received from Dr. Demers you will see that his condition is not as bad as was at first thought. I hope the convention will be both a pleasure and a profit to all in attendance, and I would like every person here to feel he has full freedom in discussing any questions that may come before the meeting."

The secretary, Mr. F. Page Wilson, read communications from the president, Dr. Demers, Mr. Levi Moyer, of Beamsville, and Dr. A. Ochs, of Hespeler, regretting their inability to be present.

At this stage, Controller Hocken entered the convention room to extend in behalf of the mayor and other members of council the welcome of the city. Controller Hocken said: "I come as the representative of his worship the mayor, who is tied up with some very important matters, to say that we all regard your organization as one of very great importance in our country. The regulating influence of the Independent Telephone Association is one the benefits of which perhaps nearly every municipality in this country has already experienced, and there ought to be a very good and very prosperous future for such an organization. Personally I am not one of those who believe in a duplicate system in a city the size of Toronto, but I am sure that in the growth of this country, as we are experiencing it to-day, there will be ample room for the very widespread activities of your organization. During your stay in Toronto if there is anything in the way of accommodation or attention that any member of the municipal administration can give to you we will all be glad to give it, if you will let us know through your president or secretary or any official of your organization."

Mr. J. B. Ware, general secretary of the International Independent Telephone Association, replied on behalf of the Association, saying: "We are gathered together as independent telephone men who have undertaken to build up for themselves and their neighbors and friends a telephone system which will furnish them good service at moderate rates. We have come here after a record of more than a dozen years of competition in the States and in Canada in the telephone field, and we feel we can look back over the past and get that which is profitable to us, and reach conclusions which beyond all question cannot be challenged, and which cannot but benefit the country. Just in a word I would like to review the conditions as they have changed during the past dozen years. In the States we had in 1895, 245,000 telephones in service. There was no competition. There had been a period of nearly 17 years of monopoly. The service was poor and prices were high. To a very considerable extent that which relates to the quality of service is true of your own country and your own city. As a result of the opportunities for competition which have



**W. Doan, M. D., President-elect Canadian Independent Telephone Association.**

sprung up there has been a widespread growth throughout our land, until to-day there are more than six million telephones in service at the end of twelve years of active competition, in place of a quarter of a million that existed before competition. As a result of competition not only have independent companies installed new plants with metallic circuit two-wire system, but they have forced the former monopoly to do likewise; and throughout the broad land we have six millions of people almost wholly on the metallic circuit and receiving their service at very moderate prices.

"The city of Toronto, famous throughout the world by reason of its progress and great commercial success, a city of the same size as Cleveland or Buffalo, has far less than half the number of telephones in service to-day. Cleveland has to-day approaching very nearly fifty thousand telephones in service, and competition has given a quality of service far beyond what was anticipated. To-day your fair city has approximately eighteen thousand telephones. We believe the people are benefitted by having good work, by having facilities for living, by having the advantages which come commercially and socially by reason of the introduction and use of the telephone; and we believe that Toronto with fifty thousand telephones in service is better prepared to conduct the commercial interests of the city and to care for the people's welfare than it is possible to do with fifteen or eighteen or possible nineteen thousand telephones, as you have at the present time. I am pleased to know that the people of Canada believe largely in competition.

"In your own municipality I understand at the pres-



ent time you are making an effort to secure competition in electric lighting. The tendency in my land is to eliminate competition by legislation, so that electric lighting, water and gas and street cars are becoming owned by corporations without competition. We believe that in the telephone business competition will continue as it has in the past, to improve the quality of service. With improved service there is a larger demand for it. Your rates are fairly reasonable in this city, but you have thousands of citizens desiring telephone service that cannot receive it, and the attitude and policy of the Bell Company in this country is exactly the same as the attitude and policy of the Bell Company in the States by reason of the fact that it is inspired from the same source—from Boston. You have from the eastward lines coming up to your city limits to-day, with several thousand independent telephones connected thereon, that cannot reach within your borders; you have to the westward within twenty miles, independent telephones, and yet Toronto cuts those citizens off, and they need Toronto connection.

"Speaking for a moment of development. There has been little opportunity for competition in the independent telephone field until quite recently. The Bell Telephone Company of Canada was organized about 1882, and to-day has in this great country less than 100,000 telephones—fewer by half than we have in the State of Michigan alone. The independents within the past four years have started, and to-day they have reached 30 per cent. in the aggregate in this province alone of all the Bell telephones that there are in Canada at the present time; and yet we have no toll connections. With toll connections with a great metropolis such as Toronto, there would have been four times the telephone users that there are to-day if we could have established competition here. Speaking for the United States, I wish to congratulate those citizens of Canada for what has been already accomplished, and hope that Toronto may open her doors to receive you in, connect citizens with your lines, and give to the citizens of Toronto what they do not now have, modern telephone service, because only through competition can high-grade service be secured.

"As far as my observations for 13 years of active effort in the independent telephone competition is concerned, there has not been one disadvantage of competition excepting the turning to two books to see if the person has the service, and there has to be taken into consideration in connection with that the fact of there being a large increase in the number of telephones in use. In my own city we had 1,500 telephones in service. Under the spur of competition, with two books in our community to refer to, we have to-day 10,000 telephones in my own home exchange and 4,500 on the Bell exchange, making 14,500 telephones in the city of Grand Rapids, and less than ten per cent. are duplicate users.

"We find there has been a wide misconception as to the burdens which come upon a community by reason of the competition. We find in 45 cities in which we have already checked the competing directories, that there is 10 $\frac{1}{4}$  per cent. of duplication of names. Of course, the duplication is largely from the business telephones, and those were repeated in many instances in the books: so that it is an open question whether there are more than seven to eight per cent. of duplicate users in competing telephone exchanges. With 92 per cent. conceded (because the facts are established) of telephone users in a community having but one telephone, with the benefits that come in improved quality of service by reason of competition, and with the regulation of rates which competition does bring, we believe that the

telephone can do for this community and this country that which has been done through competition in our own land, and bring those benefits within the reach of the public at large."

Mr. F. Page Wilson, the secretary-treasurer, then presented his report, as follows:

### Secretary's Report

Gentlemen,—In spite of what our friends the enemy tell us, the independent movement in Canada has no need to be ashamed of what it has accomplished during the past year. In view of the fact that this movement is only about three years old, its progress has really been remarkable, especially when it is remembered that the Bell Company, taking at least one or two lessons from its experience in the United States, has dropped some of its old-time arrogance and now pretends to try and meet the wishes of the public. How far this will go remains to be seen, but it is something accomplished to have brought the monopoly to a sense of the truth that it cannot flout public opinion forever.

The work of education, not only by this Association, but as a result of a spreading of public knowledge of the formation of local systems, is manifested by the rapidly increasing number of rural companies, especially throughout Ontario. Approximately, the number of Independent phones in operations in Canada at the present day may be placed at between 26,000 and 27,000. In Quebec also good progress has been made in the movement. I had hoped that our esteemed president would have gone into this part of the subject in greater detail, but owing to his illness, which we all, I am sure, deeply regret, he is unable to be present with us on this occasion.

Report, to hand from the West, states that in Alberta and Manitoba, where the Bell equipment was purchased by the Government over a year ago, the mileage and number of phones in use by the people have increased very rapidly. In Saskatchewan also, the Bell lines have been taken over by the Government, at a better bargain, I am glad to note, than was the case in the other two provinces named.

A feature which has obtained growing prominence during the past has been the disposition among Independents to form branch associations, such as the Southern Counties Telephone Association, and the one in the neighborhood of Brockville. This matter of forming district associations is one that might with advantage be taken up at the present time by this Association, and if carried out in the right manner, on the plan adopted in Ohio, should be rewarded by much benefit to the Independent cause in general. The success of such combinations as the York Telephone Union is another sign of the times.

Another matter which your secretary deems it his duty to bring before you for discussion, and, if possible, for definite action, is that relating to troubles arising between two or more independent companies, which are naturally a weakness to the cause we have at heart. Some plan, I think, should be devised whereby disagreements as to division of territory, etc., should be easily brought before a central body, or some such body as the Railway Commission, for adjustment. The Ontario or Dominion Government might with propriety be approached in this regard.

The Association is glad to be able to state that during the year the Board of Railway Commissioners has decided in favor of independent companies being allowed to place phones in railway stations. You are to be con-



gratulated on the fact that this long-standing contention has been settled so satisfactorily.

Thanking you for your attention.

F. Page Wilson,  
Secretary-Treasurer.

The financial statement, which followed, showed a small balance on the right side.

Mr. Denholm moved the adoption of the report.

Mr. G. W. Jones: "With the exception of one clause in the latter part of it, I am agreeable to adopting the report. The clause I refer to is that which states that the arrangements at the railway station are quite satisfactory. Of course, they are satisfactory, I suppose, but when we put a telephone in the station in our section the railway company have made the statement that it was a nuisance. We kept a tab on the number of ingoing and outgoing messages in that station for one month, and found that they had about eight messages to our three. Although I do not object to paying the dollar, I claim that it is not a fair arrangement yet. I think we should have it gratis, and I do not like to have it go out that we are entirely satisfied with that arrangement. It is not the amount, but the principle of the thing."

Mr. Denholm: "There is a difference in railway companies. With the American railways, such as the Michigan Central and the Pere Marquette, we have no difficulty at all. In fact, they make it easy for us to make crossings over their lines. With the C.P.R. it is very different."

The motion to adopt the secretary's and financial reports was carried.

The Chairman: "We are pleased to have with us to-day Mr. J. B. Ware, of Grand Rapids, who comes here as the representative from the International Telephone Association. We will be pleased to have him address the convention."

Mr. J. B. Ware: "I exceedingly regret that Mr. Moulton, the president of our association, was unable to be present, but it was the express wish of Mr. Moulton that I should convey to you on behalf of himself and the other officers of the International Association the high regard which they hold for you and their best wishes for your prosperity. I am here as a business man, and I would like to talk to you for a few moments regarding our business, which in our judgment is about the best business there is, as being the safest, as being the most beneficial perhaps to the communities in which we reside, a business that once built up stays by us, and is not affected by the conditions of the times, as are other lines of business.

"In 1895, when our company was formed at Grand Rapids, the conditions were very unfavorable for the doing of a successful telephone business in opposition to the Bell interests, and in comparing those conditions with the present we have much to be grateful for, not alone as the result of our own effort, but particularly as the result of the manufacturers in the independent telephone field in the developing of apparatus, in showing us economical ways for the conduct of our business and the operation and maintenance thereof, and in the accomplishment of results which would have been absolutely impossible but by reason of the competition in the independent manufacturing field. At the time we entered into the business in 1895, the construction throughout our country was inferior in quality, and there was not that inducement or necessity or financial advantage to come from the developing of the business itself as a business which there has been since competition has prevailed. In 1895, not two per cent. of the tele-

phones in the United States were on metallic circuit, and there were only a quarter of a million telephones in service.

"As a result of competition in the manufacturing field we have apparatus which enables us to give a strictly first-class service, not only in cities, but in the rural communities as well, and the service throughout the country, both here and across the line, is far superior to what has existed in the past. The encouragement is this, that by reason of the large number of competing independent manufacturing plants there has come to be that higher standard in quality of apparatus which enables any one of you gentlemen, or any citizen of Canada, to purchase in the open market telephones and telephone apparatus, and telephone supplies, not only in every way superior to anything that existed before that competition, but superior, as a rule, to the corresponding telephones and apparatus and supplies furnished by the representatives of the former great monopoly. You may think that is simply talk, but it is true. The prices of telephone apparatus, quality being compared, are very much less than in former days, and the success which has attended the development of the telephone by the independent companies throughout the land has been so marked that there is no question about our ability to maintain successfully any plant which is properly built and properly handled; by that I mean, properly built and then operated by men of average intelligence. This telephone business has stood more improper operation and management than any other business I know of throughout our land or yours, and yet it has prospered, and the failures have been so exceedingly few as to make it in marked contrast to any other line of business, and there is no branch of the commercial world which can show as few failures, comparatively, as can the independent telephone business.

"There are one or two matters that I wish briefly to refer to. In the States until recent years it has been the policy of the so-called Bell companies to make no connection with the independent companies, to give no recognition to them, and it was not until the Government statistical report in connection with the census of 1907 was issued that the Bell Company officially did give recognition to the independents, and that standing which their position demanded by reason of their numerical strength. To those of you who have not looked into the matter, it will be of interest to know that in 1907 there were about 22,000 independent telephone companies, large and small, and 3,000,000 independent telephones, as against about 3,100,000 of the Bell telephones, or about 100,000 difference. When we remember that in twelve years, from less than a quarter of a million telephones in the United States there has been such an increase under the spur of competition, that to-day there are over 6,000,000, you can see how great has been the development, a more marvellous development than in any other line of business.

"The policy of the Bell until recently has been one of exclusiveness, and it is only by reason of the fact that the growth of the independents was found by the Government to be 187 per cent. during the period of five years to about 132 per cent. by the Bell, that the Bell companies have changed their policy, so that in certain localities now the effort is made to secure connection with the independent exchanges by putting the Bell toll lines upon those local exchanges, and giving simply an opportunity to telephone over the Bell system. That tends to break down the independent system, to cut out independent toll lines and to make it possible for the Bell companies to have the only long distance system in



our land. This has caused a desperate struggle to take place in the telephone field, especially in the great central west, and we regret to state that some who should have remained with us loyally have become traitors to our cause, and knowingly so. They have made those connections or have sold out, knowing it would injure our movements.

"My own judgment is this, that there must be competition in the telephone field. Bell competition is the best competition, because Bell Companies cannot operate and maintain their plants as cheaply as can independent companies. That has been demonstrated beyond question, and it has come to the point where we must determine whether we will remain loyal to the people's interest and our own interest and build up our system and take our profits year by year, or whether we will betray our own best interest, as well as those of our neighbors, by forming alliances with the Bell. I think the worst is over as far as that is concerned; but be that as it may, there are more telephones in the United States than ever before, there is less indebtedness on the independent telephone properties proportionately than in any other line of business in our country; there is a greater union of interest and of action among the independents of our country than ever before, and my own judgment is, that the next few months will see a development and a unity of action which will enable us to accomplish far more than we have in the past.

"This city has to-day probably 18,000 telephones. Detroit, a city of probably about the same population has more than double that number of telephones in service at the present time, and a rapidly increasing number. Cleveland has more than 50,000 telephones in service. In proportion to your population the telephone development of this country is greatly inferior to the telephone development of the States. You will never get, under monopoly, under one-company-development, in your towns and rural communities, the development that we have in the States. The Bell Telephone Companies have not developed the rural communities and villages and towns; they have developed the cities, and thrown out their toll lines and connected them together. They have taken the high price service, the most profitable service, and to-day they denounce the inferior service, the rural service, as unprofitable, as it is to them. They cannot compete with local companies, so that the development of your great country outside the large commercial centres depends upon the people.

"Now, we see the result of the change from the Bell monopoly in the results which have been recently obtained under Government ownership. One year before the Government of Manitoba undertook its campaign for Government ownership there were less than 10,000 telephones in the province. When there was a possibility of Government competition the Bell Telephone Company of Canada began the development of the smaller towns, and put out some rural lines where it was necessary to protect their interests; so that at the time the Government actually purchased the Bell interests in Manitoba it bought 14,000 telephones. During the short time in which the Government has owned the telephones in Manitoba, there has been a 50 per cent. increase in the number of telephones; and yet the business has simply started in its development. There is no question but that as local municipalities develop their own lines there is going to be a very rapid increase in that province. In Saskatchewan there will be a much more rapid increase than was possible under the Bell company. In Ontario, through your efforts, or the Government entering into and inspiring the building up of these local systems, we hope and expect the public at large are going to have

the benefits of the telephone. Upon you falls the burden to establish where there are no telephone systems, systems which will build up and lead to toll connection between yourselves; and if you continue in the next few years as you have in the past, you will have 50 or 80 per cent. as many telephones in service as the Bell Company, or even equal their numbers, and then you will be able to knock at the doors of Toronto and get permission to establish in this municipality an exchange, and with one commercial centre you will accomplish what we have accomplished in our country.

## Telephone Directories

By W. DOAN, M. D.

Most managers give careful attention to their purchase of equipment and supplies. They keep in close touch with the market and have a pretty good idea all the time about how much they should be charged, but when it comes to issuing a directory they leave it all to the printer. True, the manager very frequently requires the printer to quote a price before giving him the order, but that makes little difference, as he has probably quoted on some expensive idea suggested by an uninformed manager. The manager may not know that he has added ten per cent. to the cost of his directory and not improved it a bit.

When the printer is first consulted, have him make up a dummy of about the proper number of pages of a suitable stock of paper with a serviceable cover. A great deal of time is lost and unnecessary expense incurred in many cases, by having a directory started in a haphazard way, without proper preparation of copy, or previously deciding on size of book, style of composition, paper, cover, advertisements, etc., etc.

There are a variety of papers used for directories, such as bonds, light manila, tag, S. and S. C. book, laid book, antique book, etc., etc., and as to covers, there are a number of kinds, as one seldom sees two directories having the same kind of cover. Few books are handled as often and as roughly as a telephone directory, and consequently they should have a cover that will stand a lot of wear and tear and at the same time be of a color that is not easily soiled, or at least does not show it. So the important thing to bear in mind is to get a cover best adapted for the handling the book will receive.

The paper and cover being selected, next decide upon the size of book. The standard size is six by nine; some have them larger and some smaller, all a matter of choice. In all exchanges having more than one hundred subscribers, it is advisable to have the directory made up in book form. Be sure to have the book punched and strung. Since you expect the subscribers to keep the book at the telephone, it must be made convenient to hang up.

Special effort should always be made to make the cover of a directory attractive and well balanced. Either a one-color emblem cut, or the two-color cuts in both colors should be used on the front of your directory. It is good policy to have both the name of the company and the place on the outside of cover. It not only advertises the company and the town, but makes a more favorable impression upon the stranger or outsider who by chance picks up one of your directories. Don't have cut-out indexes in your directory unless you have a big one—one hundred pages or more. It costs considerably more and is entirely unnecessary in a small book. A marginal index not cut out, answers very well and costs a mere trifle.

Having settled the size and shape of the directory, the size of type and general composition of contents should be determined. For large exchanges, eight-point



or brevier is the size usually used. Where the list of subscribers is not so large, ten-point or even twelve-point can be used. The larger type makes a page easily read, and an exchange of a few hundred subscribers can produce a directory that compares favorably in size with that of a much larger exchange.

The style of composition is a matter of choice. A page set according to one person's idea would find disfavor in the eyes of another. The most common style of setting the line full, using leaders to fill space between the name, occupation and address, is, however, giving way to that of eliminating the leaders entirely. The advantage of this style is that the eye can at a glance, get the entire information wanted, namely, number, name, occupation, and residence, without having to follow the leader line so as to pick up at intervals the required information. The subscribers' numbers should be in large bold face figures so as to be easily recognized.

As to display advertising in a directory—our company has never under any circumstances permitted an ad. in our directories. Of course, this matter of ads. should rest entirely with the company issuing. As to my company, we have confined ourselves strictly to a telephone directory, and not derived any revenue from the by-products which a directory may be made to produce. Some very neat-looking directories are made up with alternate pages of advertising, or with inch ads. running at top and bottom of each page. Trying to display every line of an ad. does not give the most pleasing appearance. The sale of advertising space may be made to cover the entire expense of publishing a directory, or if not all, will at least reduce the cost to a mere trifle.

Copy for the printer of a directory is quite difficult to complete. Changes are being made daily—new names added, others taken out, so that copy must be continually revised. The first three or four pages should contain information and suggestions for the patrons, as poor telephone service is more frequently caused by the person using the telephone than otherwise. All copy, especially the list of names, should be typewritten. Such advice may seem unnecessary, yet in some instances from smaller exchanges, copy is supplied in long hand that can hardly be deciphered. This not only makes it more expensive and wastes time in setting up the book and making corrections, but generally produces a directory inaccurate and full of errors overlooked. When advertisements are to be inserted, be sure all the ad. copy is ready and sent in at once, with size of ad. and position clearly marked. As far as possible, all copy should be sent in at the same time, accompanied by a "dummy," on which is shown the position of each ad., the order of the several lists, position of cuts, etc., etc.

It is always more satisfactory to have ads. written on the stationary of the firm advertising, or attach a business card or letter heading to the copy. In this way many errors of mis-spelling a firm name is avoided, as the compositor can only make out a name as the copy appears to him. Never send in a little bunch of copy now and then, or ads. as they are collected from the advertiser, and after the book is almost printed, ask that this or that be left out or changes be made in the first run that was made. Contradictory instructions are a source of great trouble to the printer, as well as those not clearly stated, and often a great deal of time is lost until the matter is finally straightened out.

### The Ideal Telephone System

Mr. Denholm presented a paper on the subject, "The Telephone From the Subscribers' Standpoint."

The speaker characterized the ideal system as one having a central office in each business centre of im-

portance with radiating lines throughout the country at a cost within the reach of the ordinary man. Long distance lines, though a great convenience, were a luxury to the great majority of telephone users. Of more importance was prompt, reliable and uninterrupted service between social and business associates in a local centre well supplied with telephones. The necessity for courteous treatment of customers and prompt attention to repairs was emphasized as necessary to promote cordial relationship between the subscriber and his company.

### Is the Telephone a Natural Monopoly

Mr. F. Dogger opened the general question of telephone monopoly in a paper entitled, "Is the Telephone a Natural Monopoly?" The speaker went on to show how threadbare the arguments of the monopolists had become, gave instances of poor service under the monopoly system, instances of good services under the system of competition, and concluded with convincing arguments in favor of active competition in this as in other lines of commercial activity, if best results are to be obtained.

Mr. Skinner, Sherbrooke, Que., reviewed the difficulties that had been met in gaining access to railway stations. Mr. Skinner said: "Most of you know already about the trouble we have had getting into railway stations, and to tell you the truth I joined this association for one purpose in particular, to get your assistance in having legislation carried whereby we could get into the stations. Personally I had tried every method I knew of up to the time of going before the Railway Commission. We had three stations on the Grand Trunk where we had connection; we should have had 14. And right here I want to give Judge Mabey credit publicly. Some years ago Port Arthur and Fort William tried to prevail with the Railway Committee to get their telephones in the station. Two of the Commissioners were favorable to it, but the chairman of the Commission was not favorable, and consequently they put the compensation so high as to make it prohibitive, and they did not get in. Then there came another chairman, and he lasted for a time and went out. Finally I got the courage to come before Judge Mabey with a petition to see if we could get our telephones installed in the C.P.R. We met the C.P.R. officials at Ottawa in the Railway Commission room, and had a consultation, and we perfectly agreed between ourselves before Judge Mabey had any opportunity of expressing himself; but I think that they anticipated that Judge Mabey would not show any more leniency to them than he would to us; consequently they were more than willing to meet us, and we drew up an agreement which we consented to, and it was then presented before the Railway Commission, and they ratified it. In the meantime I was endeavoring to reach the railway stations along the Grand Trunk in the same way without appealing to the Commission. I thought if we appealed to the Commission and did not succeed we would get driven out of those places which we already had; so I was hesitating for a long time before bringing the matter to the Railway Commission. Finally we brought it before the Commission, and it was argued pro and con. We did not get a reply for pretty nearly two months, and when we got that reply we did not get all we asked for, and I am not very proud of what we did get. It is true we got the right to get into the station by paying \$1 a year. What we asked was to be put in on the same conditions as the Bell Telephone Company. To-day the Bell Telephone Company furnishes one telephone free; other telephones in connection with the railway station are paid for at regular rates. They get pay from the railway people for all long distance tele-



phone messages, but for local service they go free. We are compelled to give local service free to all their employees, but for any long distance messages they, I suppose, pay. There is another consideration we do not like, and our president very much objected to signing the contract in that way, that is, if your telephone is damaged while in their possession you have no recourse. If their workmen want to smash it up they can do it, and we cannot help it. These two things, the charge of \$1 a year, and their not being responsible for the telephones, are the only two real objectionable features that I can see in it.

Mr. House (Bridgeburg): "We have had some trouble with the railway companies in our station. As soon as we made the application to the Michigan Central they allowed us to put telephones in at once. We made application to the Grand Trunk at the same time, and they agreed to let us put them in if we paid \$12 a year for each telephone, an outlay of \$48 to us. We refused to accept the conditions, and consequently did not install telephones there. We realized we were somewhat handicapped by not having the connections with the stations, and took the matter up with the heads of the freight and passenger departments with a view to get them to intercede for us with the company, but without any apparent result for perhaps a year. Finally they agreed to allow us to put in telephones if we would pay the nominal sum of \$1 a year. That was before the Railway Commission had given any decision in that matter. We refused to accept that condition. We stood upon the ground we were as much a benefit to them as they were to us, and if they would give us the same privilege as the Michigan Central did, we would install telephones, otherwise we would remain out and boycott them. Just recently we received contracts from the Grand Trunk signed by General Manager Hays himself, asking us to sign the contracts and install telephones; but they had that \$1 a year attached to them. We returned them, and we filled out our regular contracts at \$16 a year, and told them if they would sign them we would be glad to install telephones for them, but we did not consider that the Grand Trunk Railway deserved better consideration at our hands than any other subscriber. While we have gained something by the Railway Commission compelling them to let us place telephones in stations at one dollar a year, we have not gained what we are entitled to."

### **Toll Connecting Relations**

"Reasonable Toll Connecting Relations" was discussed by Mr. S. L. Squires (Waterford). Mr. Squires said, in part: "Reasonable toll connecting relations—that is not a defined subject. I am glad it does not say between independent companies; I am glad it does not say between independent companies and the Bell Company; but it gives a man the whole scope of the field. I suppose what is meant by that subject is, a reasonable exchange of toll connections between companies who are occupying the same or neighboring fields, and in this way we possibly occupy a unique position. We have independent companies to the east of us; we have the Canadian Machine Company to the north of us; and we have the Bell Telephone Company right within our system. We have already made connecting arrangements with the Erie Company to the east, the automatic or Canadian Machine Company in the city of Brantford and County of Brant to the north of us, and we have for three years been battling with the Bell Telephone Company on the question of toll relations and toll connections. I would like here to diverge a little to say a word or two on the subject of co-operation. Have we, after all, as an Association, accomplished very much from a

co-operative standpoint as far as the independent telephone companies are concerned? I contend we have not made any advance, and I believe it is because we have been left as independent companies to make individual play that the Bell Company has stepped in and taken advantage of our weakness. We are to blame, and not the Bell Telephone Company. They have taken advantage of the situation which has come out of, shall I say, our own inexperience? For, unfortunately, independent telephone companies have, as their personnel, persons like myself who had no telephone experience. It is only by co-operation that we can hope to accomplish anything. I believe the independent telephone companies require to get the latest information. How shall we get it? We can get it through a proper organization. I believe if we are going to complete organization and make it possible to make toll connections between independent companies, it would be wise to spend the income for one year to make the independent companies more closely connected. I believe if we can by any means improve the organization so that this Association will become a live Association, the funds which have been lacking heretofore in carrying on the improved work will be forthcoming. This Independent Telephone Association undoubtedly, together with the independent companies, have raised by education, agitation and actual operation, the telephone from a mere individual benefit to a national necessity; they have made it necessary that the farmer have his telephone. To-day we are an unorganized, disconnected lot of units. All over this country there are independent companies; but what is going to be the goal of the whole affair? I believe, and I think most men in this convention believe, that the only solution to the whole affair is Government ownership of long distance or toll lines. We should try by agitation or other means to get a Government (if we cannot get this Government to do it, create a Government) which will introduce a measure to undertake the ownership of long distance toll lines. We would find then that we were all units of one great system; and every man would be able to congratulate his brother over a telephone system that would extend from one end of this Dominion to the other."

Mr. Skinner said that the Bell Telephone Company was sapping the life of the Independent Association by connecting with new enterprises and asked if somebody could solve the problem of preventing it. "When I am in the country," he said, "and want to get a line to a principal town, I have no other way to reach the doctors and lawyers and grocers and so forth, except through the Bell Telephone Company. Is there not some way out of it? If there is anybody who can solve that difficulty I wish they would make the plan known."

Mr. Suddaby (Burnt River): "A few years ago independent telephone companies tried to get organized and asked the Bell Company for connections, and they were refused. To-day there is not an independent company started without the Bell Company knowing it and having a man there asking for connections, and until the independent companies get long distance lines of their own and get their own connections with the towns there is very little use of the telephone service throughout the country. Until such long distance lines are built independent of the Bell Company we are not independent at all. That problem, to my mind, is before the Independent Telephone Association above all other problems.

"There is another matter I wish to speak upon: the subject of taxation. I find in going through the country among the farmers, asking them to take stock in a telephone company, the men who have money in the bank are more difficult to enlist in the independent telephone



cause than the men who have not so much money, but who can with difficulty get ten, twenty, thirty or fifty dollars together to put into the business and help it along. Then we find that as soon as the telephone is up the municipalities assess it for taxes, and those men who have the money and won't put it into the telephone business to help the country, pay no taxes on their capital in the bank or on mortgage, and the only tax they pay is on the income derived from the principal. Rural telephone lines where they have derived no income at all have been asked to pay taxes. In one township they assessed us \$135 a mile. I claimed we came under section 3, which states that party lines and branch lines are not to be taken into consideration for assessment purposes, and after a great deal of argument I got the assessment removed on that ground. Now we have put in a switchboard and we have a trunk line between our place and Fenelon Falls, and with reference to the amendment in 1906 that those lines shall be assessed "at their actual value," they claimed what they cost is their actual value. I claim their actual value is their selling value, or value as income capitalized. Take the value the first year we operated. If we capitalized our actual income it would not be more than \$25 a mile, and they will assess it at \$60 a mile. Next year we have to pay that assessment."

A delegate: "Is it customary to tax rural telephone systems?"

Mr. Squires: "We are in five townships; three municipalities tax us; two of these are town municipalities. We have but one township that taxes us, and the amount is very small. Instead of it being \$135 a mile, we pay only about \$10. We take the position we are a party line."

Mr. House: "I may be wrong in this, but unless you have a certain number of miles you are not assessable at all."

Mr. Suddaby: "You are wrong."

Mr. House: "We have not paid any assessment on mileage. I think the amount was 25 miles before you could be taxed. We pay taxes on the business in villages where there are switchboards."

"In connection with the question of reasonable exchange of toll business I would just like to ask the question, Is it wise for any independent company to make any connection whatever with the Bell Company? That is a question to think about. I believe it might possibly work out to the advantage of the company making that connection at the present time, but if we expect to have an independent system throughout Ontario it certainly cannot work to the advantage of the system for any local company connecting with the Bell Company on the terms the Bell Company are operating at the present time, and I doubt very much whether it would work out to our advantage to make any connection, because the company that is connected would lose enthusiasm."

The Committee on Resolutions then presented its report, as follows:

Resolution re connecting with Bell Telephone.

"Whereas it is reported that the Bell Telephone Company is making a strenuous effort to induce independent companies to enter into agreements for the interchange of service;

"And whereas such interchange of service is detrimental to the independent telephone interests, and will naturally and effectively restrict the development of the telephone business:

"And whereas if such interchange of service is permitted by the companies it will result in the perpetuation of the 'Bell' monopoly to the disadvantage of the

general public in quality of service and limited development.

"Therefore be it resolved that no member of this Association shall after this date enter into any agreement or arrangement, or renewal of same, having for its object the interchange of service over the lines of the Bell Telephone Company of Canada."

Moved by Mr. Hoover, seconded by Mr. Geo. Jones, that the resolution be adopted.

Mr. Suddaby: "If you cannot do the best thing, you must do the best you can. There are some of us who are forced to connect with the Bell Telephone Company. Of course, that resolution would bar us from membership in this Association."

Mr. Skinner: "As I look at that resolution I think the Association is being asked whether or not they will continue this Association under absolute independent organization, or whether they will admit Bell telephone connection."

"Mr. Ralph: "Are there no conditions under which it would be beneficial for rural telephone companies to enter into an agreement with the Bell Telephone Company? I think some companies were organized with that in view, that they were to get connection with the Bell Telephone lines. Are there not times when it would be to the detriment of the organization of rural telephone lines if this were carried out?"

Mr. F. D. MacKay: "Speaking from experience, what Mr. Ralph says is absolutely true, that 90 out of every 100 of the rural companies that are formed first take up the question, can we get Bell connection? I can point out some rural companies that ceased to have any anxiety with regard to the Bell connection, and went on and built their lines. I can tell you other instances where the companies rushed to the Bell Company, and pay three and four dollars a year for their Bell connection; and there are other ones who waited for the Bell to come to them, and are paying very much less rate. I believe in Mr. Ralph's case they went all the way from \$3 per subscriber per year down to their present arrangement of five cents a call for every local call made in the city of Brockville. When you sit down and consider the proposition from all these standpoints, the question comes to us, as an Association, what are we going to do? How are ye going to develop the independent movement to ensure its future? I believe at the present time the condition of a good many local companies is benefitted by Bell connection, but I believe the independent telephone movement in rural lines depends on keeping out Bell connection entirely, if possible, because we all know that the Bell people do not give us connection without having an object in view."

The Chairman: "I think all of us who have telephone connection with neighboring companies, be it Bell or be it independent, recognize this fact that once you have established a toll line connection between your company and a neighboring company, or exchange connection between your company and a neighboring company, it is next to impossible to sever that connection. The general public care nothing about your dividends or squabbles; they want to be able to talk from one company's line to another's, and once that connection is made it is almost impossible to break it."

Mr. Squires: "Our friend mentioned the fact that many rural companies are formed and seek Bell connection to get to the larger towns; but let me say, after all the most profitable telephone business is obtained in those villages or towns, and by forming a company within those towns you can have connection independent of the Bell Company."



Mr. Ralph: "We could have done that had we had enough enthusiastic supporters behind us to have taken stock in the company. The people were quite ready; one town sent us a deputation asking us to go into their town, the town of Prescott; but it requires money to do this, and the Bell Company has it. We had to make connection with the Bell."

Mr. A. F. Wilson: "There are two attitudes in which this may be viewed; one, as a public question; the other, regarding our financial status. I understand there is a movement in the Government to give trunk line service for the province. If the rural companies associate with the Bell it will retard progress with the Government. It seems to me the life of independent companies is in the trunk line business. If the companies depend upon the Bell Company for connections it means when the first enthusiasm and energy is gone, and the old men are tired out and new hands come in, the Bell Company will absorb the independent companies. That has been the experience in the United States, and has been the case in Ontario, that after a time it fell into the Bell Company's hands at a very low rate. I was secretary of this Association and travelled throughout the province, and I found that those companies that did not ask Bell connection made infinitely better progress than those that did."

"We had the question of connection up between our company and a neighboring company. We came to a notable fight, and the wires were cut. The pressure on the part of the public was so great that it was found impossible to detach. And so it will be, that once the connection with the Bell is made it will be difficult to separate, and the independent company will be at the mercy of the Bell Telephone Company."

Mr. Denholm: "My company has nothing to do with the Bell, and any necessary messages are transferred by the agent. Companies that unite with the Bell lose their development; they fail to progress. While it may be a convenience for them in the meantime, and please the sentiment of some of their subscribers to have connection with the Bell, yet it is fatal to their progress. If the independent companies will stay alone for a time, and use their influence, the question will be effectively dealt with by the Government of this province. We should see that exclusive franchises are not granted, and that the provision giving power to municipalities to give exclusive franchises is done away with."

Mr. House: "What effect will that resolution have on the companies who have already made connecting arrangements with the Bell Company? Would it cancel the membership?"

Mr. Hoover: "I think the Committee on Resolutions had that thought in view, and the resolution, I understand, states that from this date no connection be allowed. Those who had already made connection would be allowed to stand as in the past."

Mr. Dagger: "The resolution merely states that no company shall enter into an agreement with the Bell Company after this date; and those companies who have already entered into an agreement cannot possibly be affected by the resolution; but it states clearly they shall not enter into any more. Is this Association to be an independent Association, or is it to be an Association existing for the connecting of rural municipalities with the Bell monopoly? If you look forward to the time when this province shall have not 50,000 telephones, but 500,000, to bring it in line with the present development of Ohio, you will have to take a stand sooner or later and be independent right from the sole of your feet to the crown of your head."

The resolution was carried.

Resolution 2 of the report of the Committee on Resolutions was read, as follows:

"That we are strongly of the opinion that the Canadian Independent Telephone Association should have, and we further recommend the appointment of, three men who shall form a Legislative Committee whose duties it shall be to watch any legislation which may be introduced which may in any way affect the telephone situation, and further that such committee receive suggestions, and if they deem wise, try to have introduced any law which may be of benefit to the independent companies."

The resolution was carried, and the appointment of the committee referred to the Executive.

Resolution No. 3 of the report of the Committee on Resolutions, was, on motion of Mr. Hoover, seconded by Mr. F. Dagger, adopted, and reads as follows:

"That whereas independent telephone companies are representing the expenditures of an ever increasing capital, and whereas the service rendered by such companies is becoming more and more of a national character."

"It is the opinion of this convention that the respective Provincial Legislatures of Canada should at once undertake the introduction of such measures as will bring about the provincial ownership of all long distance lines."

"That a copy of this resolution be sent to each of the various Premiers."

The Finance Committee presented its report as follows:

"That the ordinary expenses of this Association be provided by contributions from the independent companies on the same basis as last year, with such amounts as the manufacturing companies may donate."

"That the president and secretary be authorized to correspond with the manufacturing companies, relative to the expense of maintaining an agent whose sole duty it shall be to encourage the increase in number and extension of operations of the independent operating companies."

The Nomination Committee's report was presented by Mr. Skinner, and after considerable discussion was amended, and the following elected:

Officers—President, W. Doan, M.D.; Vice-President, C. Skinner; Secretary-Treasurer, F. Page Wilson, pro tem.

Executive Committee—F. Dagger, T. W. Ralph, Dr. Demers, G. W. Jones, A. Hoover, S. L. Squires, M. House, Levi Moyer, T. R. Mayberry, M.L.A. Auditors—C. B. Adams and Dr. Dales.

During the discussion of the Nominating Committee report, Mr. MacKay moved, seconded by Mr. Squires: "That the Association appoint a permanent paid secretary, and that the amount of his remuneration be left in the hands of the Executive Committee, to be dealt with at a meeting to be held within the next thirty days; that if satisfactory arrangements can be made with Mr. F. Dagger, we recommend to the Executive his appointment as permanent secretary." Carried.

A motion was introduced by Mr. Dagger, seconded by Mr. Hoover: "That this Association expresses regret that Dr. Demers is in ill-health and unable to be at the convention, and hopes that he will soon be restored to health and strength; and that the Association desires to express its appreciation of Dr. Demers' services in the past." Carried.

Mr. House moved that the next convention be held in Toronto, on Wednesday of the second week of the Canadian National Exhibition. Carried.

The convention then adjourned.



## Montreal News

Messrs. Dawson & Company report a brisk trade in electrical supplies. The outlook is particularly bright in the West, according to Mr. W. A. Lewis, who has been in charge of this company's Winnipeg office since April last.

We understand that Mr. Goodwin, of the Midland Electric Company, is likely to become a resident of Hamilton, Ont., in the near future.

Mr. R. Boronow, of the Engineering Equipment & Supply Company, has just returned from an extended tour on the Continent, where he investigated the latest developments in flame arc lamps and other new apparatus. He reports that flame arc lamps have been widely adopted for street illumination and especially for the lighting of railway stations and yards. Mr. Boronow also completed arrangements with a number of important Continental firms which will enable his company to introduce some entirely new apparatus to the Canadian market.

Visitors to Montreal during the "Old Home Week" celebration were genuinely delighted and surprised with the reception tendered to them on their return to their home city. Perhaps not in its history has Montreal celebrated so continuously and so well. By day, the gaily colored pennants and bunting announced that the city was en fete. By night the varied electrical illuminations created a brilliant effect. Under ordinary conditions Montreal, with her excellently lighted business thoroughfares and numerous electric signs, might well be termed the "Great White City," but with special decorations and here and there on the tall buildings huge electrical signs of welcome, a transformation was effected. All through the week an industrial exhibition was in progress at the Coliseum, and it is pleasing to note that electrical men were chief promoters of this feature of the "Back to Montreal" celebration. Though only a limited number of electrical firms exhibited, those who spent so much time and expense in arranging their displays were deservedly rewarded by the keen interest manifested on the part of the visitors who attended the exhibition. The Montreal Light, Heat & Power Company was prominently represented and their display, with its multitude of moving lights, its endless array of novelties and its special features in the way of modern applications of electricity for household purposes, was one of the most popular rendezvous for the crowds.

The King Electrical Works, Limited, of 6 and 8 Chenneville street, Montreal, also made a very effective exhibit of electrical fixtures in their booth at the Coliseum. The display was neatly arranged and the interior of the booth was finished with green baize. Particularly noticeable was a line of shades and domes decorated with the "plato" finish.

The Canada Electric Company, 230 Dorchester west, L. Rousseau, manager, had a neatly arranged exhibit in charge of Mr. A. White and Mr. E. N. Gagnon. The company showed some effective designs in domes, portables, dining room fixtures and electroliers of beaded cut glass.

A neat exhibit observed at the exhibition was that of the Eastern Electrical Engineering Company, 316 La-gauchetiere street west. The exhibit, in charge of Mr. J. D. Lachapelle, manager for the company, was particularly noticeable at night, due to the brilliant illumination created by two Adams-Bagnal regenerative

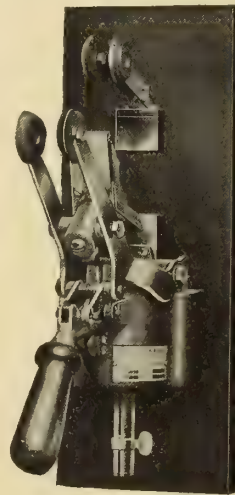
flame arc lamps. The company showed full lines of electrical supplies for domestic service, including electric toasters, glue pots, small heaters, stoves and vacuum cleaners, also exhibiting desk fans, sewing machine motors, meters, spark coils and insulating varnishes.

The display of the Sayer Electric Company was placed prominently at the entrance to the Coliseum, and was a feature of the exhibition. The booth was in charge of Mr. E. W. Sayer and Mr. E. Decelles, and a most complete line of electrical supplies was shown. In the centre of the booth, a showcase containing various novelties was placed, and surrounding this was a slightly electrified brass rail. As the visitor approached the showcase he reached a portion of the floor wired and damped especially for the occasion. On touching the rail a practical demonstration of the power of electricity was demonstrated to the unsuspecting victim.

The Sayer Company also exhibited full lines of fuses, switches, sockets, conduit supplies, electric toys, fancy tone electric door bells, skeleton bells, factory and house telephones, and a novel telephone outfit consisting of 4 batteries, 2 telephones, 150 feet of wire, staples, etc., suitable for communication between house and coach house, all complete for \$7.50.

### Condit Circuit Breakers

The Condit Electrical Manufacturing Company have recently made considerable improvements in the details of their low voltage circuit breakers. Formerly the arc was broken by means of two rather heavy rectangular blocks of carbon so placed that the contact was made by a slight rubbing action of the flat surfaces. This arrangement has been replaced by a device shown in the



accompanying cut. The auxiliary and main contacts remain practically the same.

In the new arrangement the four discs consist of homogeneous moulded carbon, and are smaller than the original blocks. These can be readily turned to present a fresh surface when one edge is burnt. This arrangement has the important advantage that the contacts reach their maximum pressure and minimum resistance at the instant that the secondary contact is leaving the switch block. This renders the secondary contact even less liable to burn now than it was before the change, and it follows that the overload rating on the breakers can be very materially increased.

This breaker is adapted for all conditions of operation and can be fitted with either overload, no voltage, underload or reverse current coils. It may be tripped by hand or electrically. Combinations of any of these are also quite simple to arrange.



## Personal Mention

The "Electrical News" appreciates the loss the Canadian General Electric Company is sustaining, but trusts that a corresponding advantage will accrue to Mr. Nicholls himself, to whom we extend hearty good wishes for continued success.

A correction—Our statement in last month's issue that Mr. Kensit had taken charge of the Calgary office of Smith, Kerry & Chace was an error. This branch office has been and still is in charge of Mr. Geo. A. McCarthy. Mr. Kensit takes the position of chief electrical engineer to the Calgary office.

Professor L. A. Herdt, of McGill University, and Mr. W. A. Lambe, of the Canadian General Electric Company, of Peterborough, have been appointed by the Dominion Government to be a board of examiners to examine candidates for positions as electrical inspectors in the Inland Revenue Department.

Mr. W. H. B. Logan, president of the Dossert Company, New York, manufacturers of the well known solderless connectors, was in Montreal last month and concluded arrangements with Mr. Irving Smith to act as Canadian representative for the Dossert devices. A full stock will be carried in Montreal.

Mr. H. J. Haffner, McGill 1904, has taken charge of Block, Winnipeg. He is sales agent for Ideal motors and generators, Buffalo forge fans, pumps, etc. Mr. Harpell has also undertaken the Western agency of the Machan & Mayer Electrical Manufacturing Company, of Philadelphia, who make a great many lines of electrical specialties.

Mr. H. J. Hoffner, McGill 1904, has taken charge of the branch office opened in Vancouver, B.C., by the engineering firm of Smith, Kerry & Chace. Mr. Haffner's work will be of a general kind, though especial attention will be devoted to irrigation and hydro-electric development, for which Mr. Hoffner's experience in railway, municipal and irrigation engineering particularly fits him.

Mr. D. W. Dietrich announces the severing of his connection with the C. P. R. Company, where for years he has supervised the installation, maintenance and operation of most of the electrical equipment and a considerable portion of the mechanical apparatus. He will open an office at 16 St. Sacrament street, Montreal, for the purpose of taking up general consulting and contracting in electrical and mechanical engineering.

The removal of Mr. A. B. Lambe to the Winnipeg offices of the Canadian General Electric Company, noted in these columns last month, was made the occasion of a pleasant gathering of his friends on the eve of his departure for the West. As a mark of the esteem in which Mr. Lambe is held, he was presented with a handsome and well equipped travelling bag together with an address from the combined staffs of the supply, sales and warehouse departments of the head office.

Mr. H. G. Nicholls, late of the Canadian General Electric Company, of which he had been secretary and assistant general manager, severed his connection with that company to enter business on his own account. This event was made the occasion recently by his friends of the head office staff of the company, of presenting him with a handsome loving cup. The presentation was accompanied by an address setting forth in hearty terms the high regard and universal esteem in which Mr. Nicholls was held by his associates.

We are pleased to note the appointment, by the Canadian General Electric Company, of Mr. H. S. Brown to the position of Supply Department Engineer. He thus succeeds Mr. A. B. Lambs, recently transferred to Winnipeg as manager of their district office there.

Mr. Brown commenced his electrical career with the Canadian General Electric Company at the Peterborough works in 1897, and spent five years in the different departments of the company's works at that point. In December, 1902, he received the appointment of Superintendent of Meter Department in the Lachine Rapids Hydraulic & Land Company, at Montreal Que. The Lachine Company was absorbed soon after by the Montreal Light, Heat & Power Company, and Mr. Brown resigned his position to re-engage, in May, 1903, with the Canadian General Electric Company. Since that date he has filled various positions, both in the head office of the company at Toronto and district offices.

We predict for Mr. Brown a career of continued success not only from the fact that he is well posted electrically, but because, in addition, he is a hard worker and of an obliging disposition, which has made him very popular alike with his immediate associates and with the numerous patrons of the company with whom he has come in contact.

## New Business Partnership

Messrs. M. Chapman and E. B. Walker announce the formation of a partnership under the firm name of Chapman & Walker, Limited, for the purpose of undertaking contracts for electrical equipments of all kinds and for the installation of gas engines, oil engines and producer plants of all sizes and types.

Mr. Chapman was for many years on the head office engineering staff of Messrs. Crompton & Company, electrical engineers and contractors, Chelmsford, Eng., and during that time superintended many important electrical and producer-gas installations. For the last three years he has been manager of the Canada Foundry gas engine department.

Mr. Walker was for some eight years with the Canadian General Electric Company as manager of their storage battery department, and is considered one of the chief experts on this work in Canada.

The ripe experience each of these men brings to the new firm augurs well for its future success. Already, through the firms they represent, a considerable number of contracts have been secured, among them being a large gas producer and gas engine installation for the Smart Company, of Brockville; a similar plant for a mine in Cobalt; a 100 h.p. plant of the same description for the town of Collingwood; a 5,000 k.w. generator for the B. C. Railway, and also large electric locomotives for the same company.

This firm will control the exclusive rights, for the whole of Canada, for Messrs. Crossley Bros., of Manchester, Eng., gas engine manufacturers; Messrs. Dick, Kerr & Company, of Preston, electrical machinery; Messrs. W. T. Henley's, Telegraph Company, wires and cables; Messrs. Nalder Bros. & Thompson, instruments; Pritchetts & Gold, storage batteries; and the "Z" Electric Lamp Manufacturing Company, metallic filament lamps. The offices of the new firm are at 69 Victoria street, Toronto.

Messrs. Smith, Kerry & Chace, consulting engineers, of Toronto and Winnipeg, who have recently opened offices at 71 Fairfield Building, Vancouver, in order to deal more conveniently with their increasing business in that section of the West, would be glad to receive catalogues of electrical and engineering supplies at that address. Mr. H. J. Haffner is in charge of the Vancouver business.



## Indirect Illumination

Ophthalmologists and medical authorities in general have long contended that a large percentage of the disorders of our nervous system and a majority of our headaches, are caused by the modern method of illumination with exposed direct lighting units. The recent advent of the tungsten lamp, with its intense brilliancy, has emphasized the necessity of protecting the delicate mechanism of our eyes from its injurious glare. Indirect illumination has long been acknowledged the more desirable method, but it is only recently and in connection with the tungsten lamps and scientifically designed one-piece powerful mirrored reflectors, that advance has been made in the illuminating field to the extent that indirect illumination can now be said to be commercially available.



I-Comfort System of Lighting in the Auditorium of South Shore Country Club, Chicago.

Indirect illumination in its most recent application consists in entirely covering the source of light with a scientifically designed mirrored reflector which casts the light on the ceiling, whence it is distributed back throughout the room. This gives the nearest approach to daylight every secured by artificial illumination. This method is in use in many residences, offices, banks, and hotels, and has recently been installed in the new ballroom or auditorium of the South Shore Country Club, of Chicago, one of that city's largest clubs. This is a magnificent separate building connected by a passageway with the main club house, and is 86 x 140 feet in size, constituting practically one large room. A 12-foot promenade, as shown, on all four sides, is separated from the main room by thirty Ionic columns. The ceilings of this promenade are 20 feet high, divided in 12-foot panels. In each of these 28 panels is hung a fixture, containing a single "I-comfort" indirect illuminating unit, as shown.

The ceiling of the main auditorium is 28 feet high and, as shown in the illustration, contains three large chandeliers hung at equal distances in the large panel of ceiling. Each of these chandeliers contains 23 "I-comfort" indirect lighting units.

The passageway to this building from the main club house is illuminated, as shown, with three fixtures in each cross panel, each fixture containing a single indirect lighting unit.

Every one who enters the auditorium is immediately impressed with the magnificent results obtained. Many expressions as to its being the most beautiful illumination seen in any part of the world are heard, and not one who sees it but realizes that a great advance step has been made in interior illumination. During a ball the scene is one of unusual splendor. The colors of the different gowns are brought out with a distinctness that is most surprising.

Plans were originally prepared to light this auditorium by direct illumination, and the cost of the direct lighting fixtures approximated \$2,000. The fixtures containing the indirect light units cost complete, installed, about one-half this sum.

The 97 "I-Comfort" inverted units used in this installation (69 in the three large central chandeliers and 28 in the small fixtures around the promenade) each using a 100-watt tungsten lamp, make a total of 9,700 watts. At 8 cents per k.w. hour for current, it will be seen that the cost of illuminating this space is but 77 6/10 cents per hour.

The fixtures are made of composition (instead of solid metal), such as is coming into general use in European countries, where elaborate designs are desired, and are given a metallic finish that simulates a solid metal fixture.

The "Chicago Tribune" comments on the lighting as follows: "Lighting scheme wonderfully effective. The illumination accomplished by a system of indirect lighting which is here employed for the first time in a ballroom, is a marvel of lambent radiance. Suspended by chains and hanging low in the centre of the peristyle are inverted domes whose metal fret work has a silken lining of Pompeian red. Great inverted domes of similar design light the dancing floor by means of mirror reflectors, which thus hide from view all the glare of direct lights. The usual harsh brilliancy of the modern ballroom becomes a mellow effulgence that idealizes the classic treatment of the room."

The Vulcan storage batteries, manufactured by the Crofton Storage Battery Company, 423-425 Queen street west, Toronto, are especially suited for telephone exchanges. Sixty-five of these cells, of a normal capacity of 240 ampere hours, have been in use night and day for over four years in the plant of the Stark Light, Power & Telephone Company, West Toronto, and have given excellent satisfaction. The Crofton Storage Battery Company recently received important orders for lighting batteries from the Canadian Fairbanks Company, Montreal, and the Canadian Cannery, Limited, Bloomfield, Ont.



## To Manufacture Tungsten Lamps

The accompanying illustration is of the works of the Canadian Tungsten Lamp Company, Limited, Hamilton, Ont., which firm has just been formed to manufacture and sell "Kolloid-Wolfram" tungsten metallic filament electric lamps. It is claimed that this make is one of the best constructed and most satisfactory "tungsten" lamps on the market to-day, as the central supported spiral filament makes it possible to burn them successfully at any angle. To show the great saving in consumption of current, it is claimed that a 32-c.p. "tungsten" will only consume a little over the amount of an ordinary 8-c.p., and give nearly four times the light.

These lamps were originally patented in Austria and the factory there has a capacity of 35,000 per day, which goes to show how universally they are coming into use. In order to undertake the manufacture of these in Canada, it has become necessary to literally transplant a factory from there, here. This, of course, is a slow process and also entails an endless amount of experimenting, but in the meantime, this progressive firm has



Factory of the Canadian Tungsten Lamp Co., Hamilton.

imported an immense quantity of these excellent lamps, which they have now in stock in Hamilton.

The officers of the Canadian Tungsten Lamp Company, which includes in its incorporation the Ontario Lantern & Lamp Company, are D. H. Girden, president and managing director; F. D. Gates, vice-president, and P. D. Crerar, K.C., secretary.

## Benjamin Wire Clusters

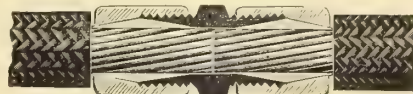
The Benjamin Electric Manufacturing Company, Chicago and Toronto, have published an attractive catalogue, C-19, setting forth at considerable length the general construction, advantages and uses of their wire-less clusters and lighting specialties. The advantages include high insulation, simplicity, durability, easy installation and ready re-finish. The uses to which the clusters may be put are legion, including lighting of every kind, inside and out.

As a result of the recent disastrous conflagration at the Ontario Parliament Buildings, Toronto, Mr. H. F. Strickland, Chief Electrical Engineer for the Canadian Board of Fire Underwriters' Association, has recommended to the Hon. Dr. Reaume, Minister of Public Works, that a bridge megger test be made every day for the purpose of ascertaining if the circuits are in good

order. Mr. Strickland is thus enforcing the practice which is common in European countries, where losses by fire are exceptionally low. Messrs. Vandeleur and Nichols supplied the bridge megger for the Public Works Department, and we understand it has given good satisfaction.

## The Dossert Solderless Connector

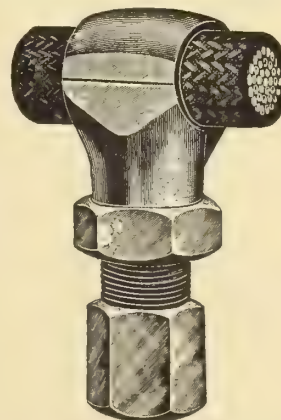
A good mechanical joint for solid or stranded conductor which, it is claimed, has great mechanical strength and an electrical conductance in excess of that of the cable, is made by Dossert & Company, New York City. The joint (type "A") consists of a nipple, two compression sleeves or bushings and two compression nuts. As shown, the compression sleeves are split



lengthwise and tapered at both ends. The tapered ends of the sleeve fit into correspondingly tapered parts of the nipple and nut. When the nut is screwed up on the nipple, the action of the taper causes the compression sleeve to decrease in diameter and grip the strands tightly together, thereby getting good electrical contact. To make a splice with this connector the insulation is cut from the cables to a distance equal to half the length of the connector, the cable is slipped into the connector, and the nuts are screwed up tightly on the nipple.

Lugs, 3-ways, Y's, reducers, elbows, and many other types of connectors are made with this principle for making the electrical connections, and can be used for connections on switchboards, panels, bus bars, transformers, meters, electric smelting furnaces, fuse blocks, service boxes, grounding secondaries and the like. For overhead work where the cables are subjected to considerable tensile strain, the company makes another type of joint (type B), but for general use the above described connector is recommended and almost always used.

A special application of this joint is the cable tap as shown in the illustration. It consists of a hook, cover,



jam nut, compression sleeve and compression nut. The hook is machined to fit the main cable, while its shank is drilled and threaded to form the nipple of a stranded Dossert joint for size of branch required. The branch is secured to connector by inserting it in the sleeve and screwing the nut up tight. Connection is made to main by placing hook part of connector over main cable, inserting the cover, and screwing up the jam nut. Mr. Irving Smith, 44 St. Antoine street, Montreal, is the Canadian agent for the above line.



# Current News and Notes

## **Cranbrook, B.C.**

The Cranbrook Electric Light Company have decided to put in a new steam plant at a cost of \$30,000 to \$50,000.

## **Coaticook, Que.**

The ratepayers have authorized the borrowing of \$14,000 for a new dam, power house and electrical plant.

## **Chippewa, Ont.**

Announcement has been made by Reeve W. E. B. McKenzie that the Electrical Products Company, of which F. A. FitzGerald and P. McM. Bennie, electro-metallurgical chemists, of Niagara Falls, N.Y., are principal owners, is planning to locate a factory in Chippewa. Five acres of the old race course have been purchased for a site, and it is said that work will commence at once on construction of the buildings. A contract has been made with the Ontario Power Company to furnish 1000 h. p. as soon as the plant is completed.

## **Chatham, Ont.**

A deputation of English capitalists visit Chatham recently, and in company with the directors made an inspection of the Windsor, Essex & Lake Shore Railroad. If they can be induced to put up the capital they talk of doing, the road will immediately be extended to Chatham, and later it is the intention to build it on to London.

## **Creston, B.C.**

The Goat River Power & Light Company plans to construct an electric railway from Creston to the Goat river, ten miles, and to build its own power plant. Power will be furnished for lighting and for other general purposes. Capital stock authorized, \$1,000,000; issued, \$300,000. R. S. Lennie, or Nelson, B.C., is president; W. K. Essling, Rossland, B.C., vice-president; J. D. Anderson, Trail, B.C., secretary treasurer; W. F. Teetzel, Nelson, B.C., general manager.

## **Cobalt, Ont.**

The Nipissing Central Railway, which is to build an electric railway connecting Cobalt, Port Cobalt and Haileybury, expects also to furnish electricity for lighting. The company has an authorized capital stock of \$1,000,000, and the officers are; J. W. Fitzpatrick, North Cobalt, president; P. L. Utley, Escanaba, Mich., vice-president; A. Jones, Haileybury, secretary; R. G. Stack, treasurer, and Clarence B. Henry, North Cobalt, electrical and general engineer.

Orders have been placed by the Mines Power Company for four 5,000 cubic foot air compressors, giving it a total capacity of 20,000 cubic feet. Each of the compressors will be operated by a 1,000 h.p. alternating current motor, electricity for which will be obtained from the company's electric power plant located at the Mata-bicheuan in South Lorain. The new machinery will be installed in the two substations at Kerr Lake and Cobalt, which will supply the upper and lower ends of the Cobalt camp with electricity and air. The two stations will be connected, so that they can be thrown into one system.

## **Fort Frances, Ont.**

The Rainy River Radial Railroad Company is seeking a charter to build several electric car lines between Fort Frances, Ont., and the American boundary, near International Falls.

## **Glance Bay, N.S.**

What is said will be the first exhaust-steam-turbine in Canada is shortly to be erected in the Central Electric power house of the Dominion Coal Company, at Glance Bay. The plant will consist of one 1,000 kilowatt generating unit.

## **Guelph, Ont.**

The Light and Power Commission for the corporation of the city of Guelph have awarded the contract to Vandeleur & Nichols for the supply of two large frequency changer sets and switchboards, and for the supply of motors, manufactured by the Lancashire Dynamo & Motor Company, aggregating about 1,600 horse-power.

## **Hamilton, Ont.**

L. D. Barchfield, representing John Patterson, of Hamilton, says that definite information with respect to the Galt-Hamilton Electric Railway may be expected any day. All the money required for the enterprise has been raised and both the Guelph and Galt lines will be built at once. It is expected that construction work will start in a few weeks. As a very large force will be put on it is believed that the road will be finished within one year.

## **Kingston, Ont.**

The city council has appointed Robert A. Ross, of the firm of Ross & Holgate, consulting and supervising engineers, Montreal, as the city's experts in the arbitration asked for the Street Railway Company to determine the cost of power provided the company from the city plant.

## **Lacombe, Alta.**

At a recent meeting of the municipal council notice was given of a by-law to raise \$25,000 for the purchase and repair of an auxiliary plant of the Blindman River Electric Power Company, Limited. If the by-law is approved by ratepayers, tenders will be called at an early date for the improvements.

## **Lethbridge, Alta.**

It is reported that a telephone line in the Crow's Nest pass will be extended to the British Columbia boundary to meet the system of that province.

## **London, Ont.**

Plans have been prepared by Engineer H. J. Claubitz, Continental Life Building, Toronto, and approved by the Water Commissioners and Power Committee, for a combined pumping station and power house to be erected at the corner of Horton and Ridout streets, London, Ont.

## **Maniwaki, Que.**

Lightning recently destroyed the power house here.

## **Moose Jaw, Sask.**

The Cobourg Rural Telephone Company is being organized with James McClelland as president, and W. W. Wagg as secretary treasurer. Mr. McClelland has completed arrangements for the immediate construction of seven miles of rural line.

## **Montreal, Que.**

It is reported that officials of the C.P.R. will shortly look into the possibilities of electrifying the Western branch. It is stated that 35,000 horse power is available at Bonnington Falls, while there are several

other good water powers along the line not yet developed. Lorne A. Campbell, Nelson, B.C., may be addressed on the subject.

The Colonial Engineering Company have offered a proposition for the construction of Montreal's generating station for the purpose of lighting the streets at a cost not to exceed \$40 per lamp a year.

## **Nelson, B.C.**

The officials of the Canadian Pacific Railroad Company are contemplating equipping the Columbia & Western branch to be operated by electricity. It is said that 35,000 h.p. is available at Bonnington Falls. There are also several other good water powers along the line, not yet developed.

## **New Westminster, B.C.**

The International Electric Railway Company will soon commence the construction of its proposed electric railway from a point in the municipality of Surrey to a point at or near Port Kells.

The council have acceded to the request of the British Columbia Electric Railway Company for permission to carry their high tension wires for the Chilliwack branch on Eighth street and the boulevard to the Fraser river bridge.

## **Owen Sound, Ont.**

An attempt is being made to organize a company to carry on the work which the Georgian Bay Power Company started four years ago. This company spent \$90,000 in purchasing rights and in constructing a tunnel 867 feet long in an effort to bring power from the Eugenia Falls to supply Owen Sound, but their work was brought to a standstill through lack of funds. It is estimated that 2,200 h.p. can be developed and delivered in Owen Sound at \$20 per h.p. \$200,000 will be required to carry out this scheme.

## **Ottawa, Ont.**

Notice is given of the intention to apply to Parliament for a charter for the Rainy River Radial Railway Company, with power to build from the international boundary to Fort Francis to the Lake of the Woods at the mouth of Big Grassie river, with branches to Long Sault Rapids and with power for telephone, express, light, heat and power business.

The Ottawa and St. Lawrence Electric Railway, the proposed belt line running from Ottawa to Arnprior, from Arnprior to Brockville, from the latter place to Morrisburg and thence to Ottawa, will be built with English capital and some four million dollars will be spent in the enterprise. This was announced at a recent meeting of the shareholders, when representatives of the English capitalists were present and talked the matter over with representatives from Ottawa, Brockville, Prescott, Perth, Arnprior and other interested localities.

## **Perth, Ont.**

The power house belonging to the Canadian Electric and Water Power Company, Limited, Perth, Ont., situated at Badour's Mills, was burned down recently, at a loss of \$15,000.

## **Port Arthur, Ont.**

The city council, board of trade and railway commission is moving with the townships of Oliver and Shuniah, towards the



# Eventually

# Sunbeam Tungsten Lamps

(Made in Canada)

# Why Not Now?

organization of a company to construct 20 miles of rural tram lines to facilitate communication between the townships and the city.

#### Phoenix, B.C.

The installation of a large electric hoist and underground tram car system is planned for the Granby copper mines in order to facilitate the handling of the ores.

#### Renfrew, Ont.

At a recent meeting of the town council it was decided to purchase a second water power from A. H. Hough, the cost of the same to be \$10,000.

#### Regina, Sask.

At a recent meeting of the Works Committee, the plan presented by Alderman Peverett for a city tramway service was approved. Application will be made to the Provincial Government for a charter.

#### Ridgeville, Ont.

A new company known as the Ridgeville Electric Light & Power Company, Limited, has been recently formed. Capital \$40,000. Incorporators, George Arnold, Ridgeville; H. A. Rose and F. W. Houston, Welland; J. C. Stoat, Fenwick, and H. S. Arnold, Toronto. The object is to supply electric light and power to places in the townships of Thorold, Pelham and Gainsboro.

#### Renfrew, Ont.

John B. McRae, consulting engineer, of Ottawa, has been engaged by the town to make a report on the advisability of installing a plant for the development of the water power recently purchased by the town.

The scheme for the amalgamation of the various water powers on the Bonnechere river here, and the building of one dam and power house for use of all, has fallen through, the figures obtained by the town council being considered too high. The council will now proceed to develop the one water power which it recently purchased for \$7,000, and has engaged J. B. McRae, of Ottawa, as engineer.

#### St. John, N.B.

The Shediac Light & Power Company will shortly open tenders for the dam to be constructed across the Scoudac river. This company has been formed with a franchise to supply electric light and power to the town of Shediac and will, when all is ready, have an adequate plant in operation.

#### St. Timothee, Que.

It is announced that the Canadian Light & Power Company, of Montreal, has arranged with J. G. White & Company, 43 Exchange Place, New York, for the engineering, design and supervision involved in the construction of a hydro-electric plant on the St. Lawrence river near St. Timothee. The old Beauharnois canal passes around the rapids in the St. Lawrence river at Grand Isle and the Canadian Light & Power Company has acquired from the government the right to enlarge, modify and use the Beauharnois canal for power purposes. Near St. Timothee the canal passes within 2,000 feet of the river bluff, and here the power station will be located. The available head is about 50 feet and the water supply is constant the year round. The present initial development provides for 21,600 shaft horse power, with such further developments as may be required in the future. The main features of the present initial construction will be as follows: (1) Construction of a canal intake the head gates at Valleyfield about 2,200 feet below Beauharnois canal from the intake to the station site, 32,000 feet,

to the capacity of the present initial installation. This will be done by dredging from a 10-foot depth to an 18-foot depth and building some embankments, and will involve changes in certain railroad and highway bridges and highways. (3) Constructing a forebay at the power station site. The concrete head wall will be of gravity section and about 40 feet high. The embankments will have a clay puddle core and will average about 30 feet in height. (4) A power station for four main units and two exciter units. (5) Tailrace excavation for the complete ten units. (6) Transmission line to Montreal. (7) Substation at Montreal. (8) Distribution system in Montreal. Some of the more important quantities involved in the work are as follows: Excavation, 1,243,000 cubic yards; embankment, 387,000 cubic yards; concrete, 45,000 cubic yards; cribwork, 6,000 cubic yards; transmission line, 27 miles. It is estimated that the present initial development will cost about \$4,000,000. The Canadian Light and Power Company proposes to do this work by contract on the basis of unit prices. J. G. White & Company are now preparing plans and specifications for the forebay excavations and embankment. Power house and headwall concrete work will be submitted to prospective bidders, and similar plans and specifications for other divisions of the work will follow rapidly.

#### Trenton, Ont.

The Trenton Electric & Water Company will develop power at Lock No. 3 on the Trent river just north of Trenton. At this point there is a head of 20 feet, and it is estimated that 4,000 horse-power can be developed. The power will be transmitted to Trenton, Belleville and the various points in the neighborhood of the latter place. They will carry the load at present handled by the Trenton Electric & Water Company from a 750 kw. 10,000 volt outfit, which was installed by the Canadian General Electric Company about fourteen years ago. Smith, Kerry & Chace, the engineers in charge, will shortly take tenders for the supply of the necessary equipment. The wheels used will be of the vertical double runner type.

#### Toronto, Ont.

Tenders will be received until October 14th for the following electric motors with exciters, switchboards, connecting material, etc.: Four 1,500 h.p. and four 500 h.p. and two 225 h.p. synchronous motors; two 1,500 h.p. and four 500 h.p. induction motors; four 500 h.p. induction motors. For specifications and form of tender apply to the City Engineer.

The Hydro-Electric terminal station in Toronto is to be located on Garrison Common, at the foot of Strachan avenue, if the Board of Control's suggestion is adopted. The station will be 400 feet long and 200 feet deep.

The entire system of telephones along the line of the Temiskaming & Northern Railroad is to be reconstructed. Several important extensions will be built this year.

#### Verdun, Que.

Chas. Brandeis, consulting engineer, 4 Phillips Place, Montreal, is preparing plans for the installation of a municipal electric lighting plant. The work will proceed at once, the town having disposed of bonds to the value of \$150,000. In addition to the installation of the lighting plant the pumping system at the sewage works now driven by steam is to be provided with electric power. Work on the new power house will be commenced first, and it is expected that the structure will

be completed before the winter probably sets in. Every effort will be put forth on the exterior so that the interior work can be proceeded with during the winter months. The new building will be erected on a site adjoining the present waterworks; it will contain three 300 horse power steam engine units, and the generators installed will, it is believed, be sufficient to serve the town for some time to come.

#### Victoria, B.C.

The final plans for the Coquitlam dam to be constructed by the Vancouver Power Company, Limited, have been filed.

Telephone connection with Strawberry Vale has been decided on. The telephone company has agreed to commence work immediately.

The bylaw ratifying the agreement with the British Columbia Electric Railway Company, under which the city agrees not to enter the power business without first offering to buy the company's plant, was recently carried. The company in return agrees to spend \$1,500,000 in installing a power plant at Jordan river.

#### Vancouver, B.C.

The British Columbia Electric Railway Company has asked for tenders for the grading and laying of five miles of tram extensions in South Vancouver. The specifications call for the completion of the work within three months after the issuance of the order to start, which means that the line will be in operation before winter.

The management of the British Columbia Electric Railway Company has awarded the contract for the grading and track-laying on the South Vancouver extensions of its tram system to Christian & Hartney. The work covers about five miles of track-  
age on Westminster avenue, North Arm road and Westminster road.

The British Columbia Electric Railway Company is issuing \$2,500,000 new capital for the purpose of making extensive improvements and of building a large new terminal in this city.

The management of the British Columbia Electric Railway Company announces that tenders will be called shortly for the grading and track laying of the proposed extension of its North Vancouver system up the Lynn Valley. The specifications call for the preparation of the line from the north terminus of the Queensberry avenue line to Nineteenth avenue, and thence to the Lynn Valley road, proceeding along this latter thoroughfare to the end of the extension. The entire length of the new line will be about two and a half miles.

#### Winnipeg, Man.

The Board of Control are considering a proposition to instruct the power engineers to proceed with plans, specifications and estimates for a conduit system for power and light distribution.

#### AWARDED.

##### Berlin, Ont.

Contracts for the machinery required for the distribution of Niagara power to Berlin have been awarded as follows:—No. 1, rotary converter, three transformers and switchboard, Canadian Westinghouse Company, \$5,748; No. 2, 3 transformers, 100 kw., Canadian General Electric Company, \$2,760; No. 3, 3 transformers, 150 kw., Canadian Westinghouse Company, \$2,748; Nos. 4 and 5, Switchboard panel, Canadian General Electric Company, \$1,118; Nos. 6, 7 and 8, frequency changer set and switchboard, \$7,400; No. 9, switchboard, Canadian Westinghouse Company, \$595; No. 10, 3 transformers, 200 kw., Canadian General Electric Company.



**Collingwood, Ont.**

The Water and Light Commission are making preparations for the early installation of the new gas producing plant recently purchased. To provide a location for the engine and dynamos it has been found necessary to add an addition to the power and lighting station. Tenders have been called for and the contract awarded to D. A. Bell for \$1,718.

**Calgary, Alta.**

Work has been commenced on the erection of the power station, dams, etc., of the Calgary Power & Transmission Company at Bow River, 45 miles from Calgary. 3,000 h.p. have already been contracted for with the Western Canada Cement & Coal Company, of Exshaw, and the transmission lines will carry 12,000 volt 60-cycle current. Smith, Kerry & Chace, engineers for this company, have already awarded the contract for two 2,000 kw. generators of the 300 r.p.m. waterwheel type to the Canadian General Electric Company, of Toronto. The balance of the tenders will be shortly awarded.

**Chilliwack, B.C.**

The Puget Sound Ditch & Dredging Company has secured the contract for the construction of Section 3, 12 miles in length, of the British Columbia Railway Company's electric line between Chilliwack and New Westminster. Another section will be let shortly.

**Lethbridge, Alta.**

The city council, acting on the advice of Smith, Kerry & Chace, consulting engineers, and the local engineers, Arnold & Reid, gave the contract for the coal and ash conveyors for the new power plant to Babcock & Wilcox, of Montreal, for \$7,775.

**London, Ont.**

The following contracts for hydro-electric line construction material have been awarded: Bissell Company, 1,200 thirty foot six inch top poles for \$2,640; 1,200 thirty foot, seven inch top, poles for \$3,600; 300 forty foot, seven inch top, poles for \$1,710; 300 fifty foot, seven inch top, poles for \$3,150; 2,000 four-pine crossarms at \$510; 2,500 six-pin crossarms at \$737.50. London Bolt & Hinge Works, 9,000 braces, 1-4 by 1 1-4 braces for \$423.90; bolts, screws, and washers, \$317.88. Northern Electric Company, 20,000 locust pins for \$320. The Locke Insulator Manufacturing Company, 20,000 deep groove double porcelain insulators for \$640. The Wire & Cable Company, Montreal, 53,000 pounds solid "T. B." weatherproof wire and 5,000 lbs. weatherproof wire at \$9,292.

**Moose Jaw, Sask.**

The Allis-Chalmers-Bullock, Limited, have been awarded the contract for the in-

stallation of 50 arc lamps. These lamps will be the Adams-Bangal regenerative type.

**Montreal, Que.**

The Weyburn Machine Company, of Weyburn, Sask., have ordered the installation of fifteen Adams-Bangal regenerative flame arc lamps. Mr. R. E. T. Pringle, Montreal, is their Canadian agent.

The Eastern Electrical Engineering Company have been awarded the contract for the installation of the electric lighting and also motors for the operation of sewing machines by the Hampton Manufacturing Company. The same company will install the electric lighting in St. Aloysius church. The wiring in both cases will be carried in conduits throughout.

**Niagara Falls, Ont.**

The Canadian Niagara Power Company have awarded to the Allis-Chalmers-Bullock Company the contract for the installation of three 300 h.p. motor generator sets.

**Prince Albert, Sask.**

The Provincial Government at Regina has awarded the contract for the completion of the long distance telephone line from Saskatoon to Prince Albert, to J. S. Bartleman, of Regina.

**Regina, Sask.**

The following contracts have been closed by this city: Canadian Westinghouse Company, Limited, one 500 k. v. a. low pressure turbine generator unit with switchboard panels and instrument, cost \$15,000 f.o.b. Regina; Canadian Westinghouse Company, Limited, one exciter unit, consisting of Westinghouse horizontal turbine, direct connected to Westinghouse direct current turbo generator to cost \$1,768; C. H. Wheeler Manufacturing Company, one C. H. Wheeler improved surface condenser, \$4,500.

**Toronto, Ont.**

The contract for the complete switchboard equipment of the Erindale Power Co. has been awarded to Ferranti Limited, through their Canadian representative Mr. Geo. Royce.

**Wanted**

Position as Telephone Engineer, or Superintendent of Construction. Fourteen years experience. Familiar with telephone circuits of all kinds, including the latest Phantom circuits. Box 835, ELECTRICAL NEWS, Toronto. 10

WANTED — Competent operator Hydro-Electric plant, Northern Ontario. State experience, references and salary required. Must be temperate habits. Box 837, ELECTRICAL NEWS, Toronto. 10

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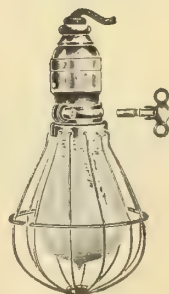
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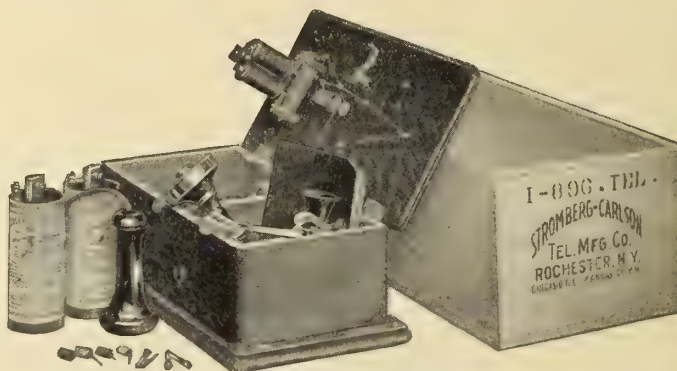
## Learn from Us What REAL Telephone Quality Is

¶ We can save money for you no matter where located. Our No. 896 Compact Type Magneto Telephone is made to "knock-down" and pack singly in boxes one half the size of most telephone shipping cases. The saving of 14 pounds gross weight on every telephone benefits the purchase of any number of telephones alike, regardless of the distance from any one of our six shipping points—Rochester—Chicago—Kansas City—San Francisco—Seattle and Toronto, Canada.

¶ The selection, indifferent to cost, of the materials used and the skill applied to fashioning each part of our No. 896 Compact Type Magneto Telephone results in a Quality Telephone being delivered having many mechanical improvements which others lack. A detachable switchhook transmitter arm and writing shelf are new features. The ringer has a gong and armature adjustment which is simple. Every cord or wire connection terminates in a metal punching designed for the purpose. Wiring, fastenings and drilling is provided extra for adding a condenser or push button key. Standard Transmitter and Receiver furnished with each instrument.

The Gross Weight  
of this  
**No. 896  
TELEPHONE**  
including  
2-Cells Dry Battery

**35**  
POUNDS



A No. 896 Telephone "Knocked Down" to Pack in Box

The Gross Weight  
reduced by  
**No. 896  
TELEPHONE**  
including  
2-Cells Dry Battery

**14**  
POUNDS

### SEND YOUR ORDERS IN TO-DAY

¶ In no other way can you effect as great an economy—we will prove this to you—our product that we are delivering the goods is our recent shipments exceeding 21,000 No. 896 Type Telephones. Don't delay the investigation and send us your order now. Pamphlet No. 17 free.

# STROMBERG-CARLSON TEL. MFG. CO.

Ontario Sales Agent:

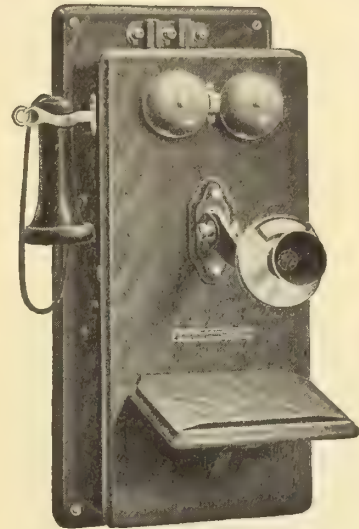
**GEO. J. BEATTIE, Esq., No. 109 Victoria Street, TORONTO**



# ut a Better One to Deliver It"

## Demand Telephones DELIVERING the Utmost Value

¶ No other Magneto Telephone ever designed has met with as great instant success as our No. 896 Compact Type Magneto Telephone. No other Magneto Telephone so perfectly adjusts itself to all the conditions of economy and general use. No other magneto Telephone contains as many mechanical improvements and serviceable parts that are really useful. This Magneto Telephone was built to give you what is best in design—highest in quality—most in value—ultimately a combination of the greatest values which you cannot afford to disregard, no matter whether you are directly responsible for the purchase of small or large quantities of Magneto Telephones.



Code No. 896

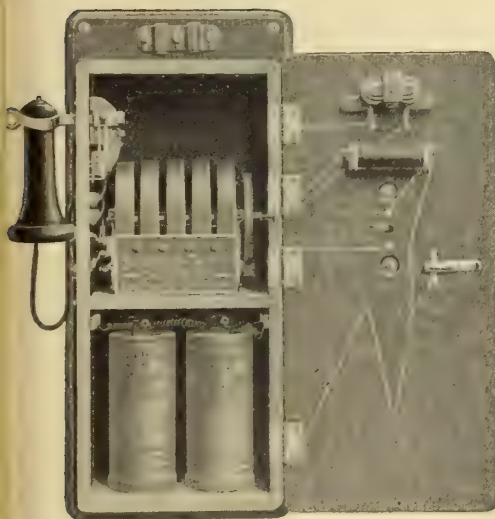
### ONE OF MANY IMPROVEMENTS

¶ By removing a machine screw on both sides of cabinet the shelf with hand generator mounted can be removed. This desirable feature is provided without increasing the width of the telephone box.

¶ The simple accessible arrangement of all parts in this telephone eliminates many wiring troubles common with carelessly assembled instruments. Our Magneto Telephones are carefully assembled and cleaned outside and inside by compressed air before being shipped. Our rigid inspections and tests protect your interest as well as enhance our reputation. Our methods are systematic and our products the best money can provide.

### SEND FOR OUR PAMPHLET No. 17

¶ You should know that we give the most for the regular price of a good telephone—don't wonder whether you know it or not—write and find out.

Code No. 896 Telephone  
5-Bar Generator—1600 Ringer

# STROMBERG-CARLSON TEL. MFG. CO.

Ontario Sales Agent:

**GEO. J. BEATTIE, Esq., No. 109 Victoria Street, TORONTO**

## Quality in Telephones

Quality is what you should consider when you are buying a telephone. Price is a secondary consideration.

## Independent Telephones

The Canadian Independent Telephones are guaranteed for ten years. They are not the lowest priced telephone but they are the best value on the market.



## Proof of the Statement

Proof of this statement is found in the fact that companies which had been using telephones that cost less money, are now, after a practical test, using Canadian Independent Telephones and are gladly paying the difference. It saves trouble and expense to get quality.

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If you have not a local telephone line in your community, write us for particulars of what others have done. Ask for our No. 2 Bulletin.

## Don't be Misled

Notwithstanding any representations made to the contrary, we again state that we are the only company actually making telephone equipment in Canada that is not owned or controlled by the Bell Telephone Co. We are a purely Canadian company building up our business on the quality of our telephones.

## Construction Supplies

We carry a full stock at all times of all lines of construction supplies at reasonable prices.

Prompt shipments and guaranteed satisfaction are making our success

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**"Z"****BUY****"Z"****Best and Brightest British Brand****"Z" Tungsten Lamps****Standard Types**

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25 "		
55 "		
100 "		
200 "		

40 Watt	}	200 to Volts 240
60 "		
80 "		
100 "		
200 "		

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Competitive Prices

Strong Construction  
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### Railless Tram System

W. A. MacKinnon, Canadian representative at Bristol, Eng., points out an interesting practice in street railway procedure that will be adopted in Newport. Several lines of railless service will be established. Poles, brackets or span wires, supporting two trolley lines, will be erected in much the same manner as for the rail system, except that the wires will be about fifteen inches apart, and instead of being +ve in polarity one is +ve and one -ve, and there is no return rail. Cables are laid in the ordinary way for conveying current, there being two conductors in place of one. The car used is like an ordinary motor bus, but with lighter tires. They will use the "pay-as-you-enter" type of car, with the door in front, no conductor being required, as the motorman collects the fares.

It is claimed that in narrow or congested streets, railless trams are less obstructive than those which are confined to lines of rails; sharp corners can be turned for which it might be impossible to secure proper rail radius.

Negotiations which are under way have reached an advanced stage for the establishing of a line of steamers from Canadian points, in connection with the Tehuantepec National Railway, which runs from Puerto, on the Gulf of Mexico, to Salina Cruz, on the Pacific coast. The negotiations are with the Elder Dempster Line for a service from Montreal in summer and St. John in winter, and with the Canada Mexico Pacific Coast line for a service between Salina Cruz and Vancouver and Victoria. It is hoped to provide monthly sailings with a through bill of lading, a guarantee against loss in trans-

shipment, and rates from 30 to 40 per cent. lower than all rail.

### MOONLIGHT SCHEDULE FOR OCTOBER

(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Oct. 1	6 10	Oct. 1	8 50	2 40
2	6 10	2	9 20	3 10
3	6 10	3	10 00	3 50
4	6 10	4	10 50	4 40
5	6 10	5	11 40	5 30
6	6 00	7	0 40	6 40
7	6 00	8	1 40	7 40
8	6 00	9	2 50	8 50
9	6 00	10	3 50	9 50
10	6 00	11	4 50	10 50
11	6 00	12	5 20	11 20
12	5 50	13	5 20	11 30
13	5 50	14	5 20	11 30
14	5 50	15	5 30	11 40
15	5 50	16	5 30	11 40
16	5 50	17	5 30	11 40
17	5 50	18	5 30	11 40
18	5 50	19	5 30	11 40
19	5 40	20	5 30	11 50
20	5 40	21	5 30	11 50
21	5 40	22	5 30	11 50
22	10 00	23	5 30	7 30
23	11 10	24	5 40	6 30
25	0 30	25	5 40	5 10
26	1 40	26	5 40	4 00
27	3 00	27	5 40	2 40
28	No Light	28	No Light	
29	" "	29	" "	
30	5 30	30	7 50	2 20
31	5 30	31	8 40	3 10

Total ..... 223 10

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Agents for Canada

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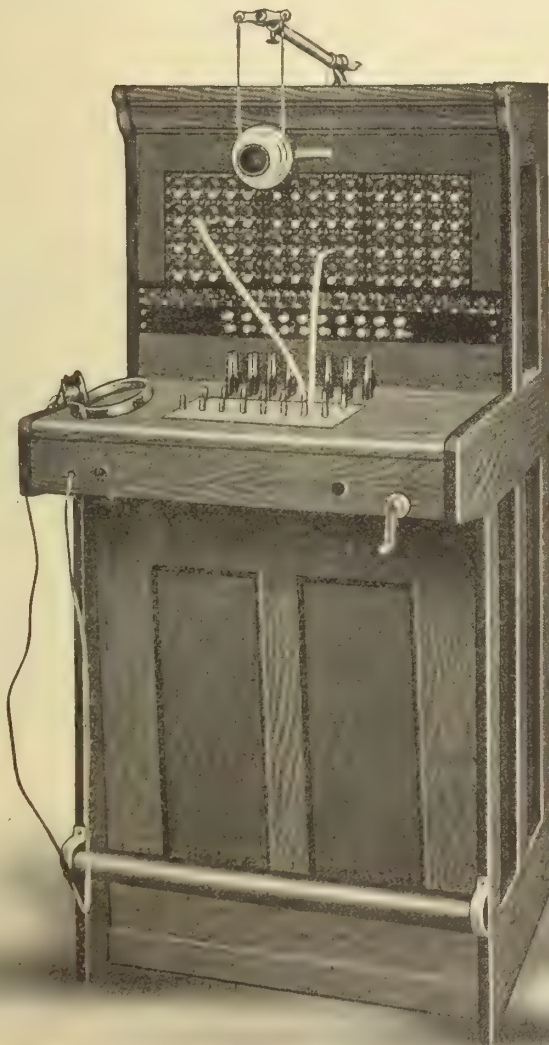
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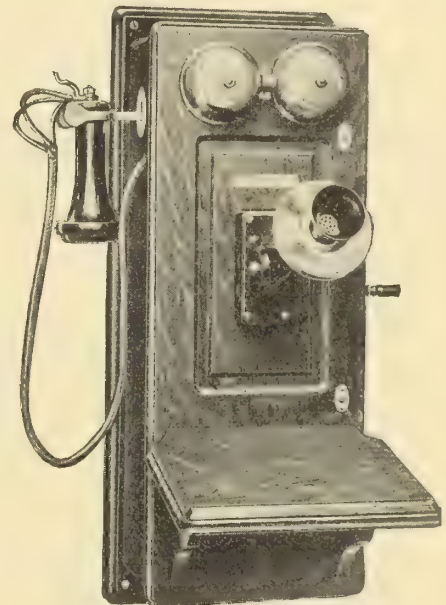
Our apparatus is fully guaranteed

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We have types of phones suited to every need.

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No. 1317 Telephone Set.

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Kellogg telephone manufacture is complete. Our Engineering Department is second to none. Kellogg telephone and switchboard boxes are built at our own wood-working plant, equipped with the best machines and covering 46,000 square feet. Our main factory covers 118,000 square feet and handles the making of every telephone part. Factory No. 2 cares for the equipping of switchboard cabinets, distributing frames and power apparatus.

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And our best proof of Kellogg efficiency is in the operating records of our telephones, switchboards and exchanges everywhere. Our customers are our best advertisement.

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Don't be afraid of them. They are the leading pole for City and Power line construction.

Yards on C. P. Railroad in British Columbia, Kootenay District.

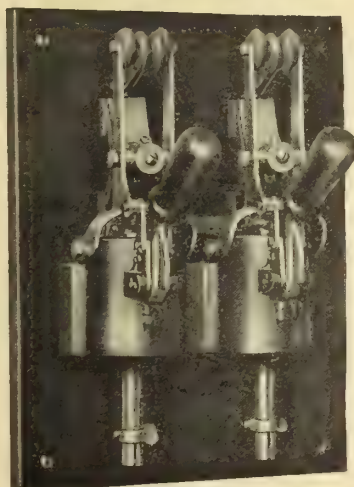
We name delivered prices **always** and guarantee immediate shipment.

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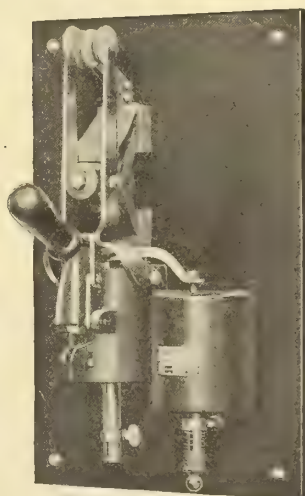


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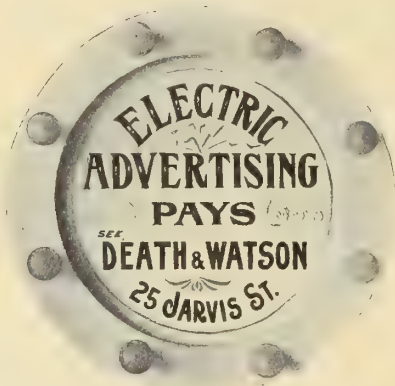
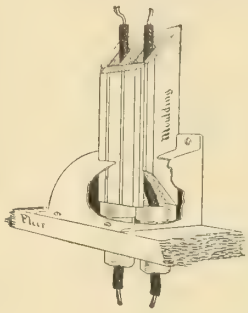
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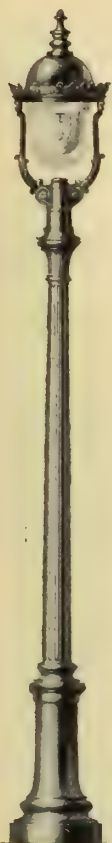
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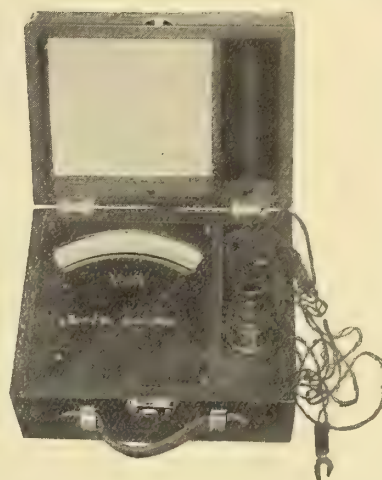
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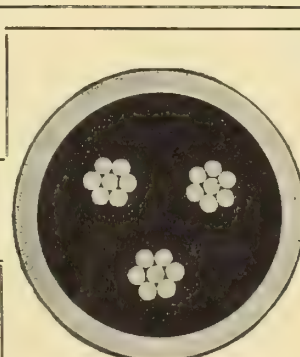
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## Electrical Contracts Awarded

Toronto, Ont.

The contract for the aluminum cable for the city power distribution plant has been awarded to the Montreal Cable Company at about \$20,000.

Vancouver, B.C.

The contract for a motor generator set and switchboard panel for Vancouver has been awarded to the Canadian Westinghouse Company.

The British Columbia Electric Railway Company has awarded the contract for the construction and grading of the New Westminster and Chilliwack section of its extension, a distance of 12 miles to the Puget Sound Ditch & Dredging Company, Vancouver. It has also awarded contracts to Palmer Bros. and Peter Henning, Everett, Wash., for the Chilliwack and Abbotsford, B.C., section, which will cost \$150,000. The contractors' headquarters will be at Chilliwack. The contracts call for completion in six months.

The British Columbia Electric Railway Company is reported to have awarded to Malcolm & Dinsdale the contract for an addition to its power plant on Store street, Victoria. The cost of the work is estimated at \$50,000.

The British Columbia Electric Railway Company has just let the contract for constructing upwards of four miles of single track lines in South Vancouver to the firm of Christian, Hartney & Christian, of this city. Operations will begin within two weeks' time, and the lines are to be completed well before the end of the year.

Welland, Ont.

G. C. Mason has secured the contract for the erection of the new transformer house of the Falls Power Company, at this city.

Winnipeg, Man.

The contract for supplying carbon for street lamps has been awarded to the Northern Electric Company at \$307.60.

The Brydges Engineering & Supply Company, Limited, have been awarded the contract for supplying a duplicate pumping plant to the Canadian Northern Railway, in two complete units, each one consisting of a gas engine, a gas producer plant and a high speed pump. Each unit will be capable of pumping 500,000 gallons of water in the 24 hours. The plant will be installed in the pump house on the bank of the Red river.

Further details are to hand in connection with the contracts for the Point du Bois power plant. The total of the figures of contracts awarded is approximately \$425,000, and the successful tenderers are as follows: Turbines: Jens, Orten-Boving & Company, London, Eng., \$97,150; includes \$11,000 for erection. Generators and exciters: Vickers, Sons & Maxim, Limited, Sheffield, Eng., \$93,080; this price includes erection. Transformers, Switching and Protective Apparatus: Canadian Westinghouse Company, Limited, Hamilton, Ont., \$150,800; including spare parts. Light, heat and power system, generating station: Canadian General Electric Company, Toronto, Ont., \$11,600. Travelling cranes: Canadian Fairbanks Company, Limited, Winnipeg, Man., (Niles-Bement-Pond Company), \$14,900; including estimated cost of erection. Auxiliary apparatus — Canadian apparatus: Canadian Foundry Company, Limited, Toronto, \$27,520; Canadian Fairbanks Company, Limited, Winnipeg, Man., \$6,901; allowance for contingencies and spare parts, \$23,049.

## Electric Repair & Contracting Co.

119 LaGauchetiere Street West  
Montreal, Que.

Makers of  
**Commutators**  
**Panel Boards**  
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### Clarence Thomson

(Ex. Examiner Canadian Patent Office.)

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may need a Telephone Exchange, but we hardly believe Canadian Exchange owners are interested.

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## Telephone Equipment

has interested hundreds of Exchange Owners and Managers in the United States—It will interest you.

† **Apparatus of Every Reputable Manufacturer** in the United States is handled by our "Rebuilt" Equipment Department - Switchboards - Telephones. Everything you need in the operation and maintenance of your telephone system.

† **Your saving is approximately 30 to 50 per cent.** and this without sacrificing quality or efficiency in the least.

WRITE OUR "REBUILT" EQUIPMENT DEPARTMENT and request our "Rebuilt" Bargain Bulletin No. 44

It will tell you all about "Rebuilt" Equipment from start to finish—Your name and address on margin of this "ad" will do. Address

### "Rebuilt" Equipment Department

Premier Electric Company

Van Buren and Clinton Street - CHICAGO, ILLINOIS

Our

## French Carbons



have won in every test; we **guarantee** uniformity and quality; of course

**Fabius  
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is the maker.

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Solid	$\frac{1}{2}$ x 12 in.	\$18.95 per M.
"	$\frac{3}{4}$ x 9 $\frac{1}{2}$ in.	\$16.25 per M.
Cored	$\frac{1}{2}$ x 12 in.	\$19.50 per M.
"	$\frac{3}{4}$ x 9 $\frac{1}{2}$ in.	\$17.10 per M.

Prices F.O.B. Warehouse, Toronto. Others sizes proportionate.

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BRANCH: 44 St. Antoine St., Montreal

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the most practical  
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is the

## "I-Comfort" System of Indirect Illumination



This system affords a nearer approach to daylight than any other method of artificial illumination, yet it involves no greater current consumption than for the direct lighting systems in general use. One 100-Watt tungsten lamp is ample for a room like the above—15 feet square, with light ceiling and dark walls.

Our new catalog contains information of direct value to you.

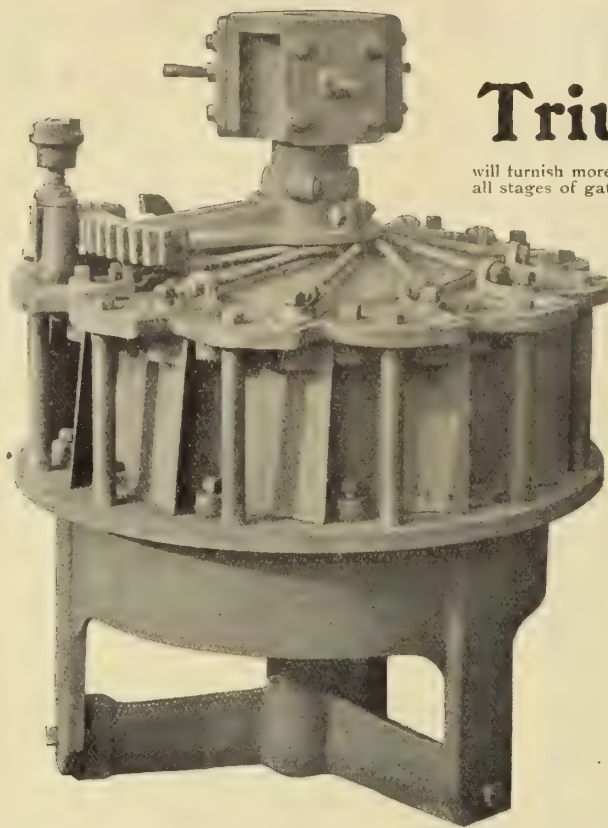
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**National X-Ray  
Reflector Co.**

247 E. Jackson Blvd.,  
Chicago, Ill.

ELEC. WORLD



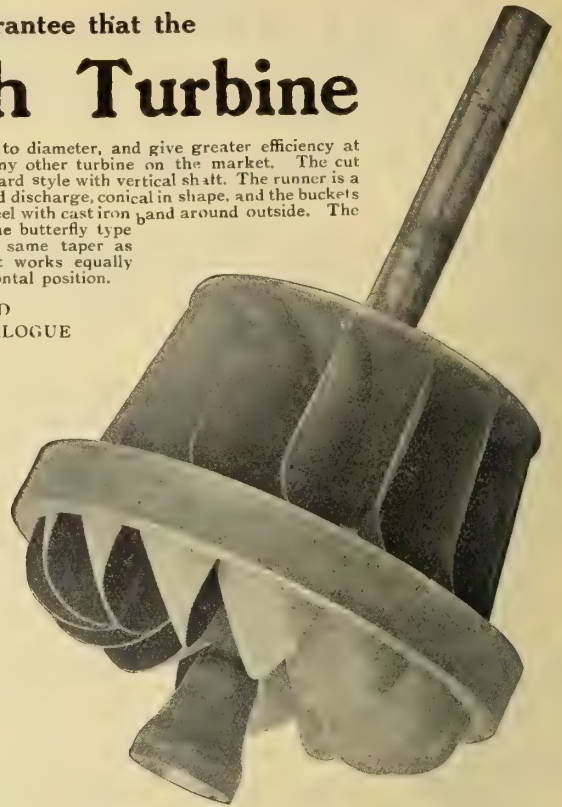


We Guarantee that the

## Triumph Turbine

will furnish more power according to diameter, and give greater efficiency at all stages of gate opening than any other turbine on the market. The cut shows our standard style with vertical shaft. The runner is a single downward discharge, conical in shape, and the buckets are wrought steel with cast iron band around outside. The gates are of the butterfly type and set on the same taper as the runner. It works equally well in a horizontal position.

SEND  
FOR CATALOGUE



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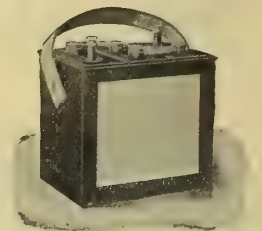
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Accumulator



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Vulcan  
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For Telephone Exchanges no batteries can equal

## The "Vulcan" Storage Batteries

Positively the leaders from the standpoint of

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Vulcan Storage batteries give more capacity for lighter weight than any other batteries on the market. Our telephone batteries have distinctive "Vulcan" features which are fully covered by "Madigin" patents in Canada, U. S. and foreign countries. They are conceded by all to be the best ever offered discriminating telephone engineers. Bulletins on request.

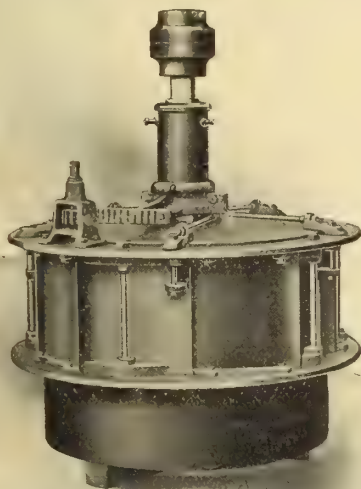
**The Croftan Storage Battery Company**

423-425 West Queen St.

TORONTO, CANADA



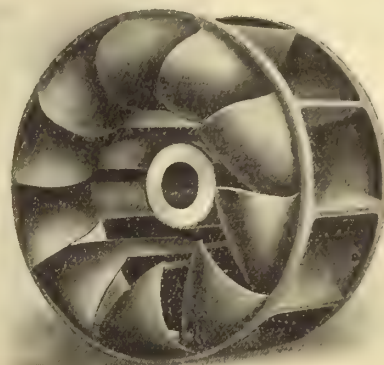
# The "Canadian" Turbine Water Wheel



We invite the closest inspection of these cuts and feel sure that the principles of both our runner and gate rig will appeal strongly to you.

Get our references and visit our shops: You cannot spend too much time and money in selecting the best water wheel: Your whole investment depends on it.

Eighty per cent fully guaranteed under working conditions and an ideal quality of power.



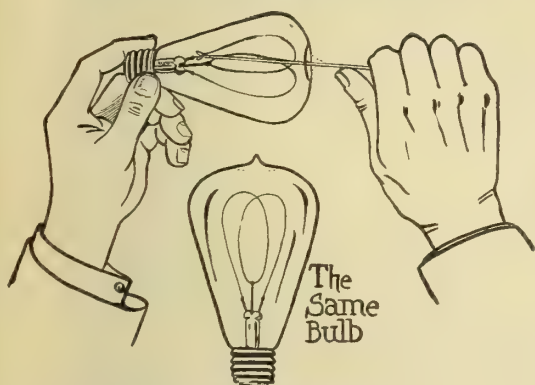
We Manufacture Turbine Water Wheels and Water Power Equipment only.

**CHAS. BARBER & SONS,** MEAFORD, ONTARIO  
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to convince you of the merits of our

## Refilled Lamps



Our method of renewing. The bulb is opened at the tip only, the remainder being undisturbed.

The Efficiency, Durability and Clearness of the lamp, itself, will speedily convince you of the saving that can be effected. They differ in price only, from the new lamp.

Why not increase, 100%, the profits of your lamp business and get in line for increased trade?

We make a liberal allowance for old lamps.

The  
**Dominion Electric Company**  
St. Catharines, Ontario



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and  
"Loricated"  
Conduits**

**FOR INTERIOR CONSTRUCTION  
Conduits Company Limited**

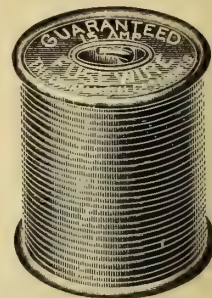
Sole Manufacturers under Canadian and  
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for All Purposes

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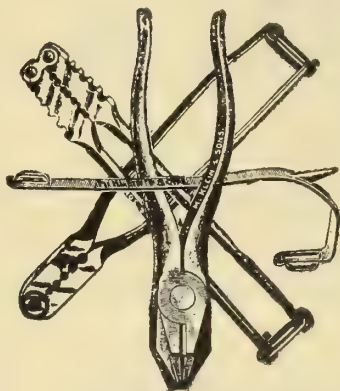


**The Canada Metal Co., Ltd.**

Toronto

## "Klein's" Linemen's and Construction Tools

Have Wired the Earth



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For the past 52 years, we have concentrated our efforts on producing work of quality, and have not permitted our name to be used on, or associated with inferior goods. For your protection in this respect, we mark all goods manufactured by us with our

full name, "M. KLEIN & SONS." Tools marked or advertised Klein Pattern are not our tools. Insist on the GENUINE which always bears the full name.

Write for our new catalogue and price list.

**Mathias Klein & Son**

Manufacturers and Jobbers of Electrician's,  
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The Finest in Existence

16 DEGREES 6B to 8H

Unequalled for Purity, Smoothness, Durability or Grading

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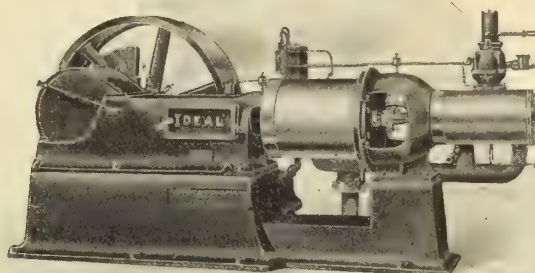
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NEWARK,  
New Jersey, U. S. A.  
Manufactory Established 1761



# Ideal High-Speed Steam Engines

Centre  
and  
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Designs



For  
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Direct  
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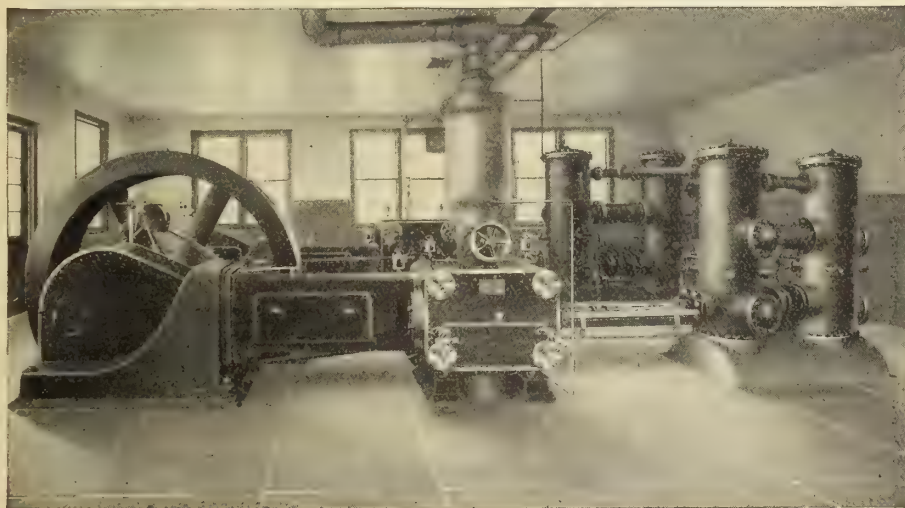
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### Engines

Corliss, Slide Valve,  
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Return Tubular, Water  
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If you have had difficulty in getting satisfactory work done our large experience and superior facilities are at your service. We guarantee to put your machines in first-class condition.

**WE PAY SPECIAL ATTENTION** to repairing all kinds of Motors, Generators, all Station Equipment, whether direct or alternating current, Starting Apparatus, etc.

Positively the best work assured in the repair of Commutators and Fields, Rewinding of Transformers, Fields and Armatures.

Tell us your troubles and let us send you an estimate.

**Specialists in the Cure of Electrical Diseases**

## The Electrical Maintenance & Repairs Co.

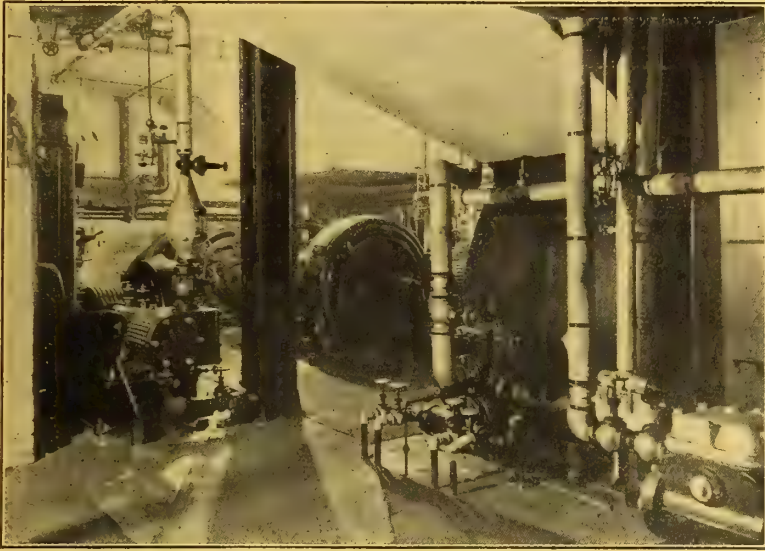
Long Distance Phone M. 3419

162 Adelaide Street West, TORONTO



High Speed

# McEwen Automatic Engine



Three Engines in this Plant

In Simple and Compound Units

Direct Connected and Belt Driven

## Guarantee

The Engine shall not run one revolution slower when fully loaded than when running empty, and a reduction of Boiler pressure from the greatest to that necessary to do the work will not reduce the speed of the engine one revolution. Any engine failing to meet this guarantee becomes the property of the purchaser upon the payment of one dollar.

## Waterous Engine Works Co.

Western Branch  
Winnipeg, Man.

B. C. Agent  
H. B. Gilmour, Vancouver, B. C.

BRANTFORD, CAN.

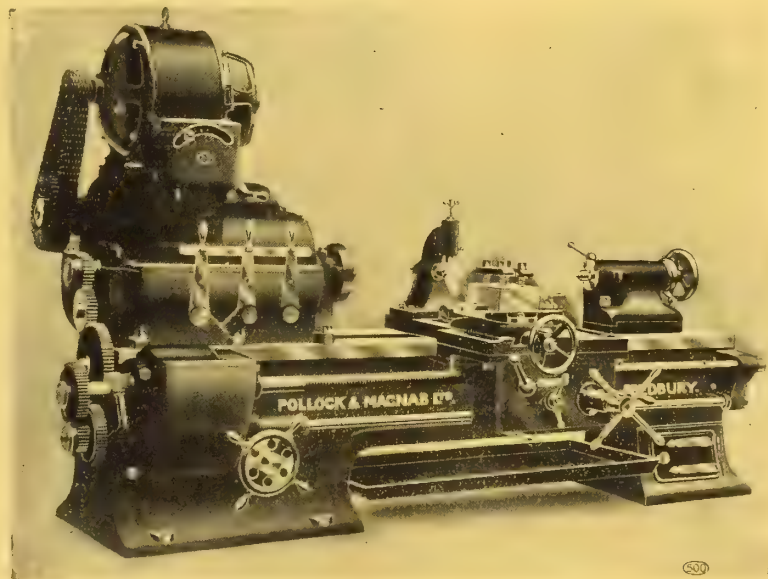
## RENOLD Patent

"MANCHESTER"

## Silent CHAIN

Will Overcome  
Your Gear Troubles

"The chain is elastic; the load is distributed over a number of teeth instead of on one or two as with gears, thus overcoming the difficulty with breaking teeth, and the drive is silent. Owing to the chain meshing with a number of teeth at the same time the drive is smoother than with gears, the latter when they become worn or out of exact alinement being jerky, and consequently taking the edge off the cutting tool quicker than with the steadier drive." The Canada Car Co. here has been running two chain driven and four gear driven wheel-lathes from individual motors and after three years' experience are changing the gears to chain drives.

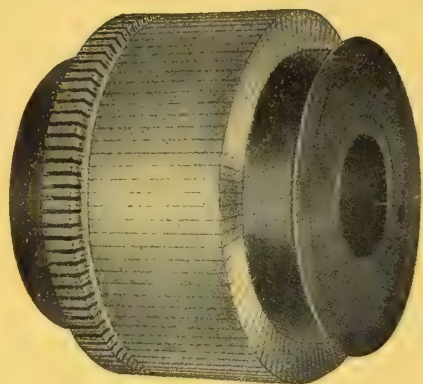


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CANADIAN AGENTS

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to have your repairing properly done. We have built up the biggest repair business in Canada, simply because we give the best possible attention to every order placed with us, whether large or small. Do not throw out the old machinery or equipment when a few dollars spent on repairs will make it as good as new.

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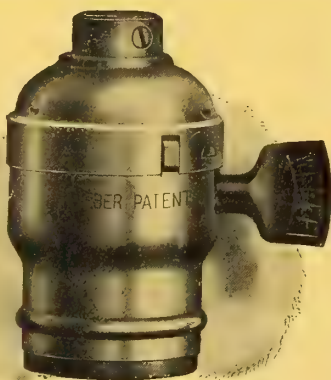
**COMMUTATORS REFILLED**

**TRANSFORMERS REWOUND**

**We Can Keep You Running While Repairs Are Being Made.**

**Fred Thomson & Co.,**

**326-328-330 West Craig Street  
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**ARE REPLACING**

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**ARE YOU SELLING THEM?**

**MUNDERLOH & CO., MONTREAL**



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**Insulators, Pins, &c.**

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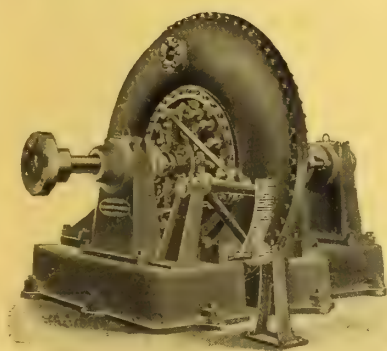
**WINNIPEG**



# Canadian Electrical News

## & Engineering Journal

### McCormick & Francis Turbines



both Cylinder and Wicket Gate, giving **ENORMOUS** power, are used in hundreds of electric power plants throughout the world.

We make a specialty of designing turbines to meet the requirements of the public.

**S. Morgan Smith Company**  
York, Pa., U. S. A.

Branch Offices:  
176 Federal Street, BOSTON, MASS. 644 American Trust Building, CHICAGO.

## Wires and Cables

**Highest C. G. E. Quality**

Rubber Covered Wires and Cables

Weather-proof Wires and Cables

Standard Flexible and Heating Cords

Annunciator and Office Wires

Fixture and Telephone Wires

Galvanized Iron Wire and Cables

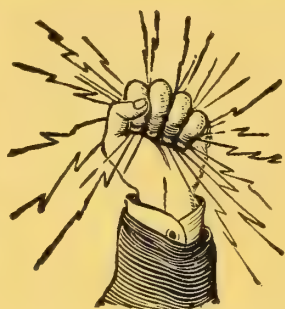
—A Superior Finished and Thoroughly Tested Product—

**Canadian General Electric Co., Limited**

King and Simcoe Streets, **TORONTO**

District Offices:—Montreal Ottawa Haifax Winnipeg Calgary Vancouver Rossland

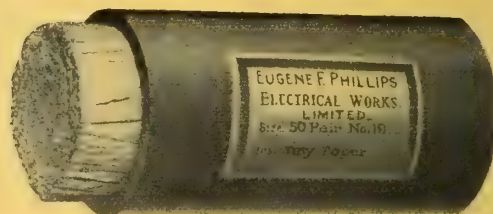
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Bare and Insulated Copper

## WIRES AND CABLES

For Telephone, Telegraph, Lighting,  
Power and Street Railway Equipment



Bare and Insulated Electric Wire and  
Cables for Aerial and Underground use

## Railway, Feeder and Trolley Wire



Weatherproof Magnet  
and Rubber Covered  
Wires and Cables



Incandescent and Flexible Cords

## Eugene F. Phillips Electrical Works, Limited

MONTREAL

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Branches: Halifax, Toronto, Winnipeg, Vancouver

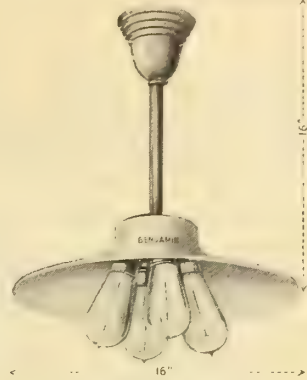


# Benjamin

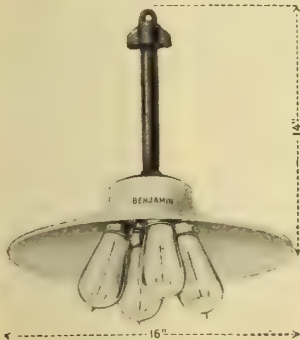
## WIRELESS TUNGSTEN FIXTURES

With Hooded Enameled Steel Reflector

Cat. No.	List Price	Cat. No.	List Price
0532 2-Light	\$4.55	6032 2-Light	\$4.20
0533 3-Light	4.80	6033 3-Light	4.45
0534 4-Light	5.05	6034 4-Light	4.70
0535 5-Light	5.30	6035 5-Light	4.95



Cat. No. 0534



Cat. No. 6034

The **Indoor Fixtures**, Nos. 0532-0535, consist of cluster, standard 12 in. stem of  $\frac{1}{2}$  in. iron pipe and  $\frac{3}{4}$  in. brass casing, 16 in. deeply hooded enameled steel reflector,  $4\frac{1}{2}$  in. x 4 in. canopy, and crowfoot. Outlets are at an angle of 16 degrees with the vertical. 2 to 4-light fixtures take 100-watt lamps; 5-light fixtures, 40 or 60-watt lamps. Prices do not include wires or lamps. Standard finish is brushed brass. In the **Weather-proof Fixtures**, Nos. 6032-6035, the cluster is of aluminum, stem is standard 8 in. length of  $\frac{1}{2}$  in. iron pipe with suspension fitting. Reflector and cluster are attached to each other by flange, and the joint made water-tight by two rubber gaskets.

SUBSTANTIAL IN CONSTRUCTION  
FINISHED IN APPEARANCE  
EFFECTIVE IN OPERATION

Write for Descriptive Circular and Discounts

**Benjamin Electric Mfg. Co.,** 64 York Street  
TORONTO

# "DIAMOND H"

## SWITCHES

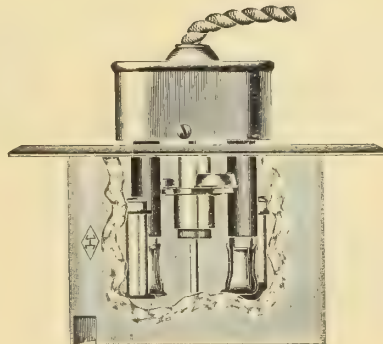
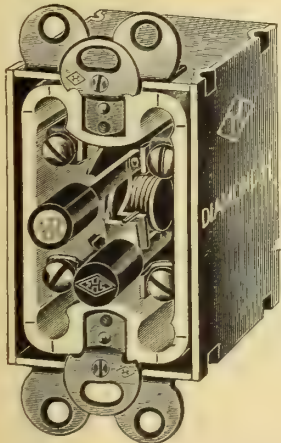
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



## APPLIANCES

Galvanized Steel all Cases  
Automatic Flush Receptacles and Plugs



MANUFACTURED BY THE HART MANUFACTURING CO., HARTFORD, CONN.

Canadian Agents:

**C. W. Bongard Co., Ltd.,** 62-64 Wellington Street West  
Toronto, Can.

# Electric Service Boxes

Sizes 11 x 6 x 3; 13 x 8 x 3; 19 x 10 x 4 inches

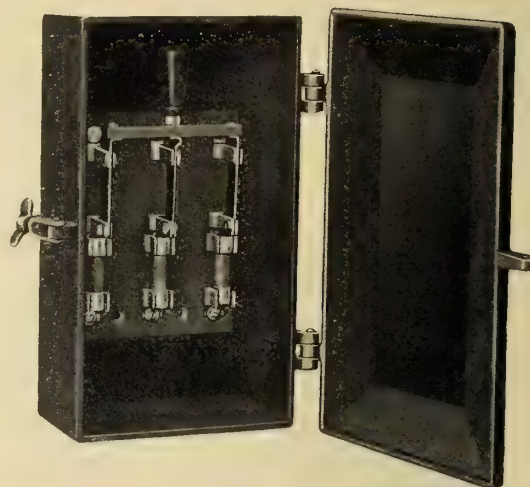


ELECTRIC SERVICE BOX  
(Exterior)

LOOK FOR THIS  
TRADE MARK



ON EVERY BOX  
IT GUARANTEES  
QUALITY



ELECTRIC SERVICE BOX  
(Interior)

**O**UR Electric Service Boxes discount anything yet produced. They will accommodate two or three wire fuse knife switches from 30 to 100 amperes. They will also accommodate National Code Standard Cut-outs up to 12 circuits. All boxes are arranged for use of thumb screw or lock.

## SPECIAL CHRISTMAS OUTFITS

Good profits can be made in selling special Christmas outfits. Now is the time to order your stock, and get after the business.

We are headquarters for Christmas outfits, such as electric irons, electric toasters, electric cookers, coffee percolators, Christmas tree outfits, electric engines and other toys, wireless outfits.

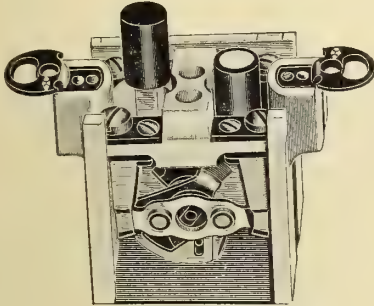
# C. W. Bongard Co., Limited

62-64 Wellington Street West, TORONTO

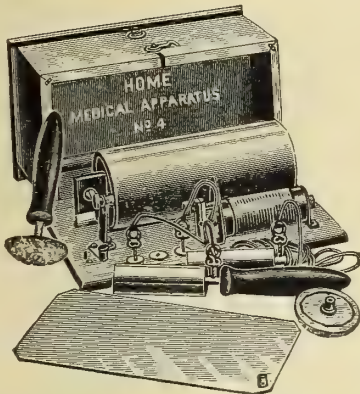


# C. W. Bongard Co., Limited

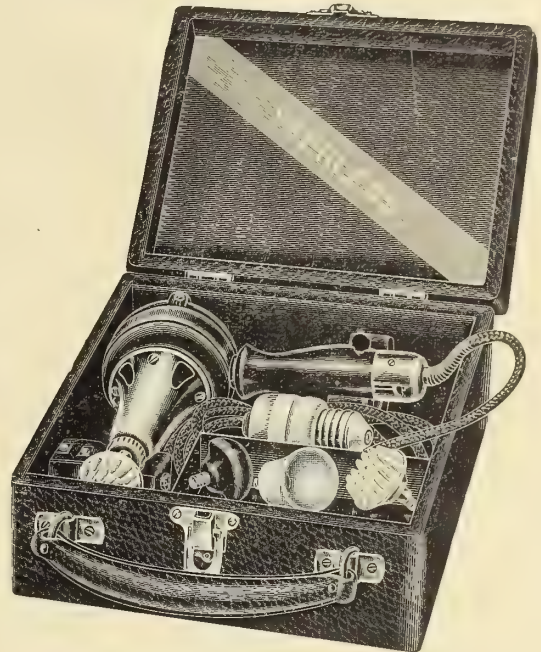
Standard Electrical Supplies



Diamond "H" Switches



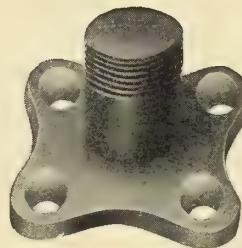
Medical Batteries



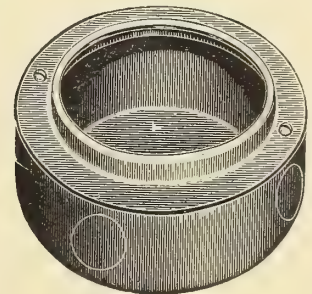
Massage Vibrators



Bushings



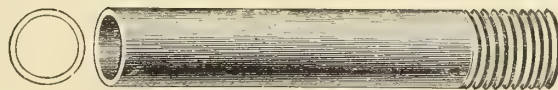
Fixture Stems



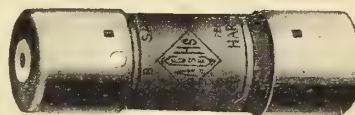
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Alphaduct Flexible Conduit



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Sachs Blocks and Fuses

We carry complete stocks of all standard Electrical Supplies  
Special attention to rush orders

C. W. Bongard Co., Limited, 62-64 Wellington St. W., Toronto

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REGISTERED TRADE MARK

## Tungsten Lamps

The best Metallic Filament Lamp on the Market

None genuine without central support and spiral filament

### Efficiency

1.1 watts per candle power

### Life

1,000 hours and candle power constant entire life.

### Saving

75% in current consumption.

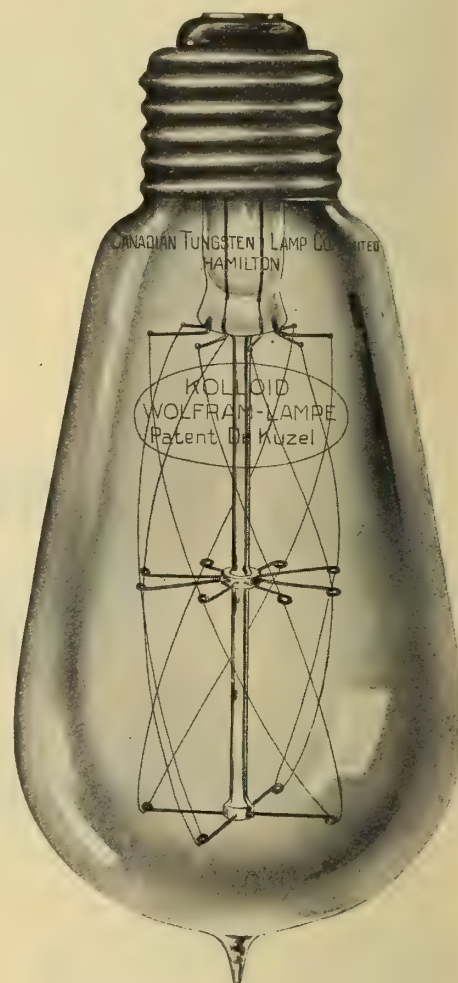
### Brilliancy

Whitest light burning at any angle on direct or alternating current.

10 and 16 C. P. in 25 volts.

16, 20, 25, 32, 40, 50 C. P. in 110, 115, 120 volts.

32, 50, 75 and 100 C. P. in 225 and 250 volts.

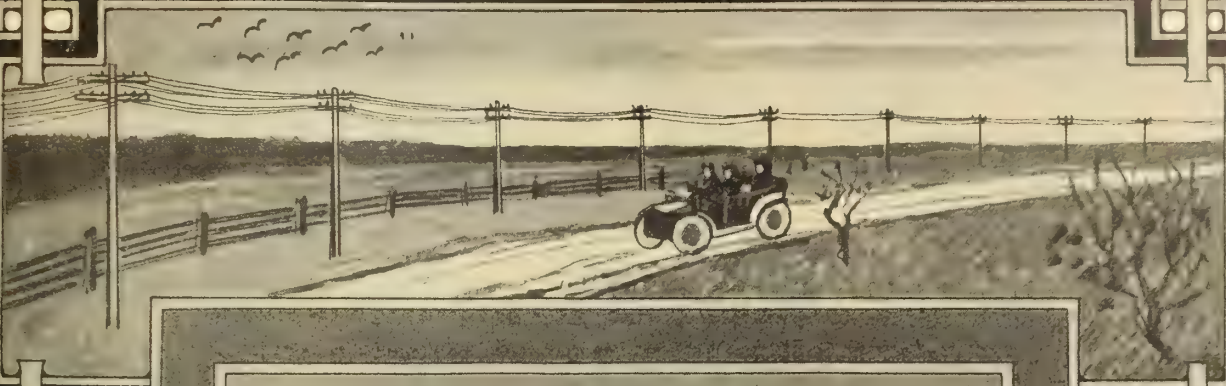


Manufactured and marketed solely by

The  
**Canadian Tungsten Lamp Co.**  
 Hamilton - Ontario Limited

Operating the ONTARIO LANTERN & LAMP CO., Limited



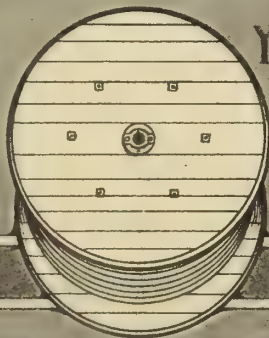


# ELECTRICAL WIRES AND CABLES FOR ALL PURPOSES

Power Cables, Lead Covered Cables  
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Rubber Covered Wire  
Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
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Etc, Etc, Etc.

LET US ESTIMATE ON

YOUR REQUIREMENTS



*The* WIRE & CABLE CO  
HEAD OFFICES • • • MONTREAL

DEPARTMENT OF RAILWAYS & CANALS  
WELLAND CANAL.  
SUPERINTENDING ENGINEER'S OFFICE

J. L. Weller.

ST. CATHARINES. 8 October, 1909.

The Packard Electric Co., Ltd.,  
St. Catharines,  
Ont.

Dear Sirs:-

Re your enquiry about the S.H.P. motors which were purchased from you by the Department two years ago for operating the lock gate mechanism on the Welland Canal, I wish to say they have proven entirely satisfactory, and, notwithstanding the fact that the work required of these motors is extremely severe, I have had no occasion to incur any expense for repairs.

Yours truly,

*J. L. Weller*  
Superintending Engineer.

# Packard

## Satisfaction

Packard Type "D" Induction Motors  
Packard Type "C" Transformers  
Packard Type "K" Watt Meters  
Packard Incandescent Lamps  
Packard Tungsten Lamps

## Get it

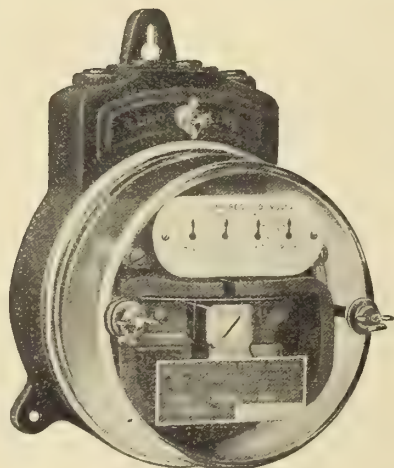
# The Packard Electric Co., Limited

Head Office and Works:  
St. Catharines, Ont.

Branch Offices:  
Montreal and Winnipeg

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## Type "C" Integrating Wattmeters



Glass Covered Meter.

**Dust-Proof. Non-Creeping. Permanent.**

The simplest, sturdiest and most dependable of integrating wattmeters. The rotor is an aluminum disc revolving, on jeweled ball bearings, in a rotating field created by the shunt and series windings. The retarding torque is provided by permanent magnets whose lines of force cut the disc, inducing retarding eddy currents. This simple motor-generator action, connected to a registering train, comprises the ideal measuring element used in Westinghouse Integrating Wattmeter. ::

Send for Illustrated Folder 4065

# Canadian Westinghouse Co., Limited

GENERAL OFFICE AND WORKS: HAMILTON, ONT.

Traders Bank Bldg.  
TORONTO.

For particulars address nearest Office:

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922-923 Union Bank Bldg., WINNIPEG.

232 St. James Street,  
MONTREAL.

158 Granville Street, HALIFAX





TRADE MARK  
Reg. U. S. Patent Office

The Standard  
for Rubber  
Insulation

Okonite  
Insulated

# Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalies. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

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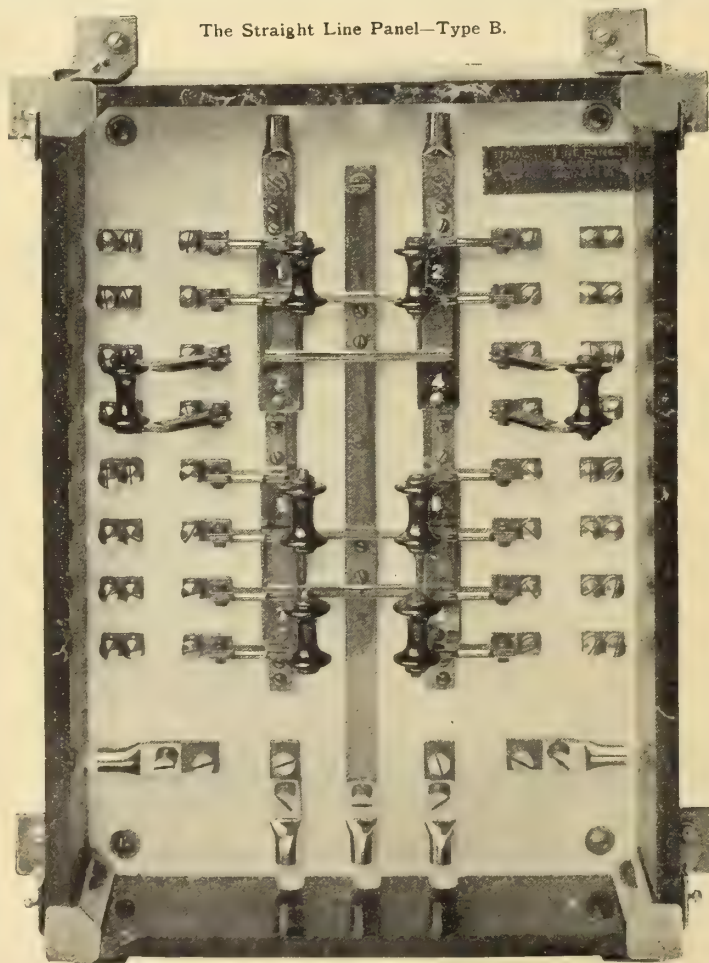
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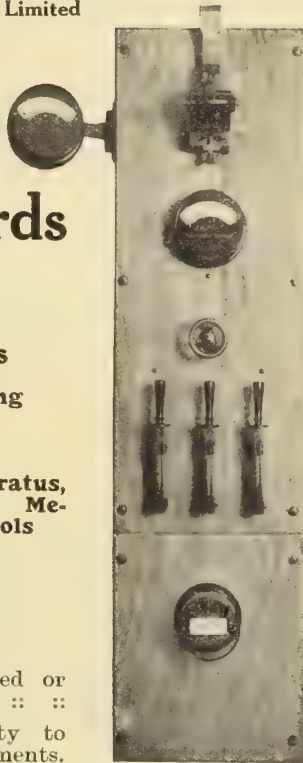
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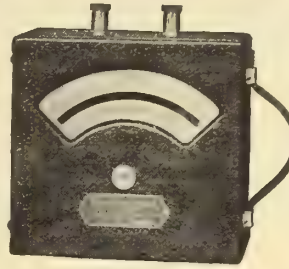
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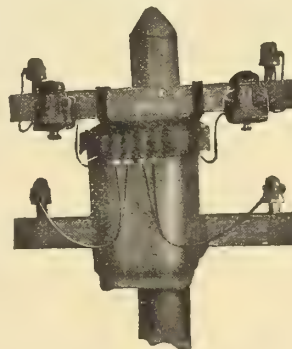
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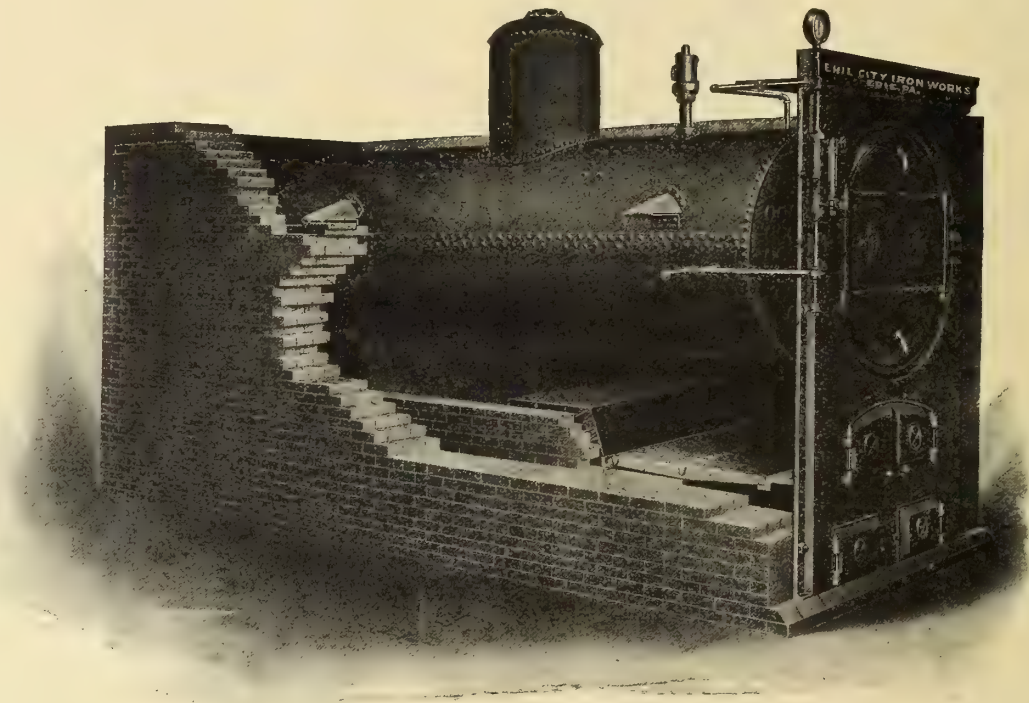
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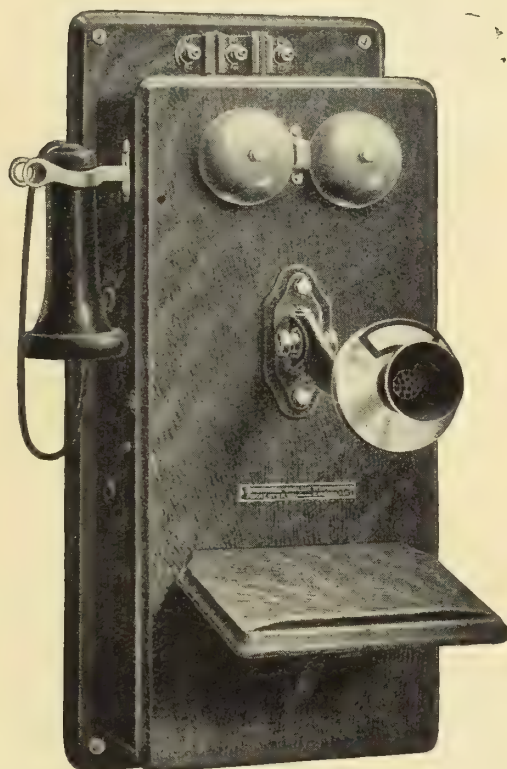
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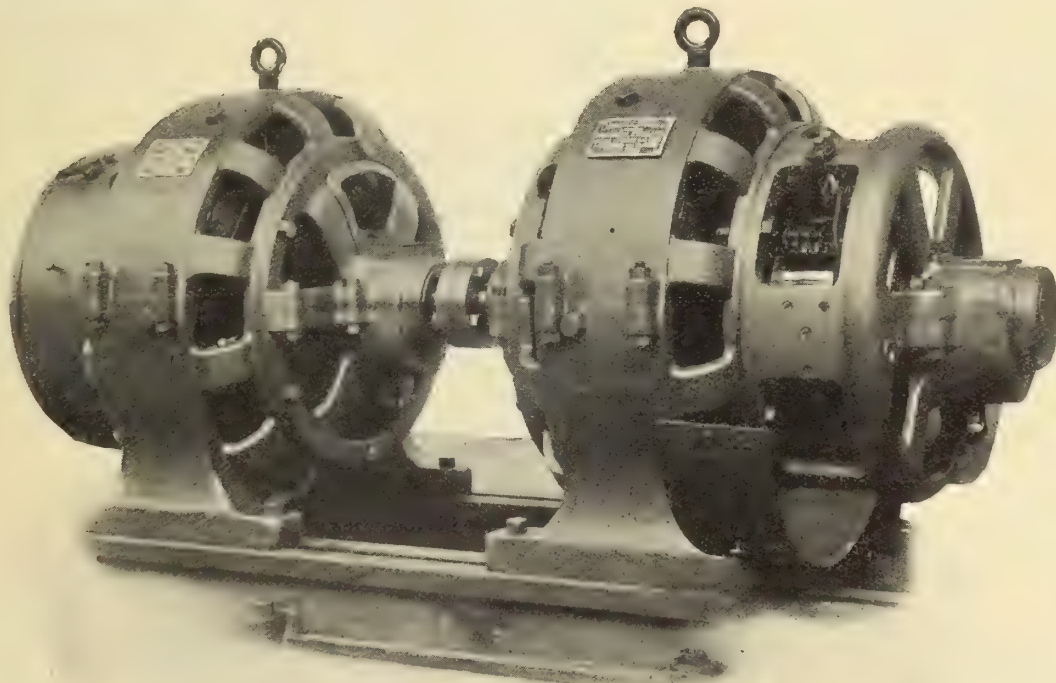
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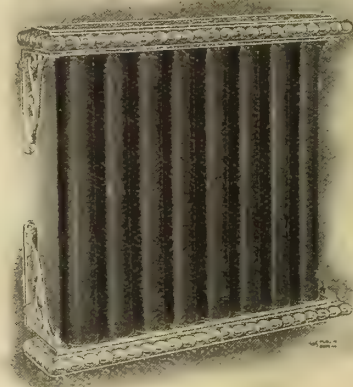
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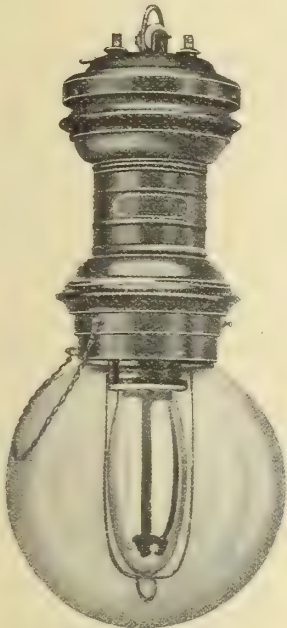


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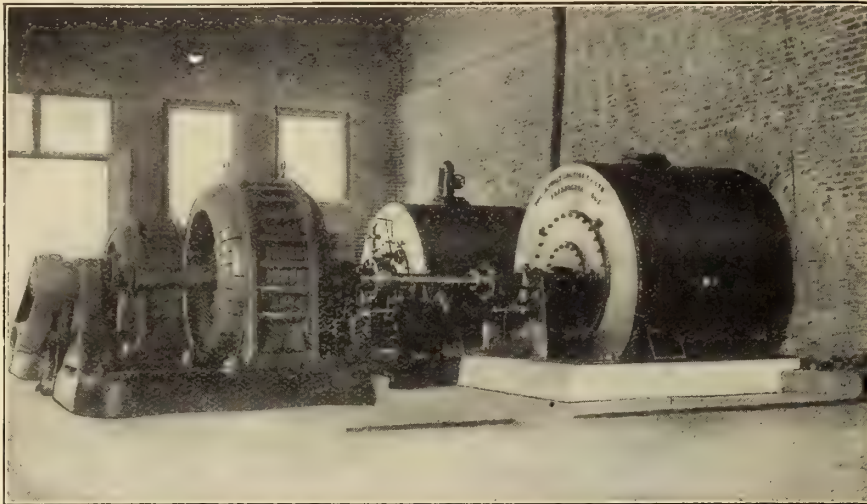
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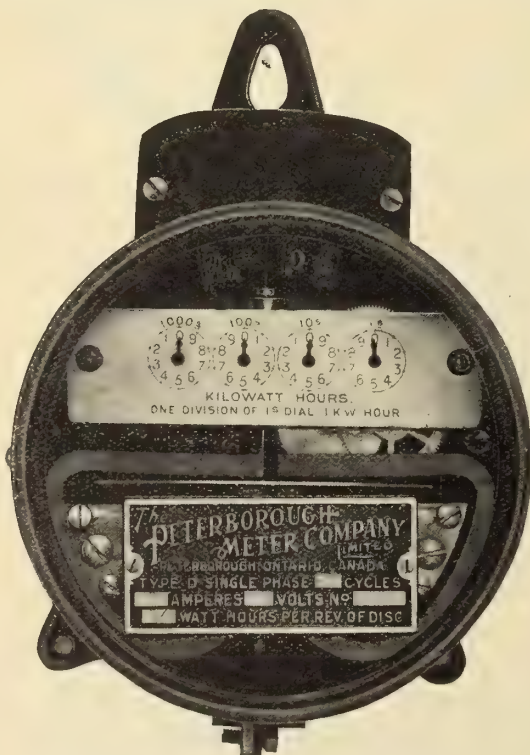
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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 8

Toronto, November, 1909

No. 11

## What is Tungsten?

A question that is asked at least once a day since the new lamps have been placed on the market is: what is tungsten? The impression generally prevailing seems to be that tungsten is a substance very recently discovered, and that it is exceedingly rare and enormously valuable. The facts of the case, as set down in Professor Walker's recent report on tungsten ores are, however, that this substance has been known in its compounds since the Middle Ages, that it was isolated as early as 1781, that its occurrence is very widespread, it being found in various parts of North America and on the continents of Europe and Asia, and that it varies in value from \$200 to \$400 a ton. The metal is one of the hardest known and is much heavier than lead, having a density 16, as compared with 11.3 for lead. These properties would recommend its use for gun bullets were it not that it requires an exceedingly great heat to melt it—no less than 3,080 degrees C., as compared with about 2,000 for platinum. The property of great hardness has caused the use of tungsten in the manufacture of steel, to which it imparts a temper that is not removed by heating. The value of tungsten as a lamp filament depends partly on the clear white light it emits and partly on the fact that it does not undergo decomposition and cause deposits to form on the glass and dim the light, as is the case with carbon. The chief ores of tungsten are: Wolfram-

mite (tungsten was originally called wolfram), a compound of iron, manganese and tungstic acid; scheelite (named after Scheele, the Swede, who first isolated tungsten), a compound of calcium and tungstic acid; hubernite or manganese tungstate; and tungstite, a hydrated tungstic acid, resulting from the decomposition of some one of the above named ores. These minerals have been found in small quantities in various parts of British Columbia, in Ontario, in Cape Breton Island and in Nova Scotia, but as yet only in small quantities. Professor Walker, however, suggests the probability that a more vigorous search will result in the discovery and establishment of regular mines.

## Corona Effects in Direct Current Transmission

The subject of corona effects with alternating current high voltage wires has been investigated at length by such men as Marston, Ryan, Steinmetz and Lyndon. The conclusions reached by these investigators are, in short, that a wire may be subjected to a certain maximum voltage, below which there is comparatively little leakage, but above which the leak increases very rapidly for slight increases in voltage; that this critical voltage varies greatly with atmospheric conditions, falling in the presence of moisture, smoke, fog or any floating particles that both the loss and the critical voltage appear to fall with decrease in frequency.

Less has been known of the corona loss from high potential wires carrying a direct current, and a paper presented before the B.A.A.S. at Winnipeg, by E. A. Watson, M.Sc., is, for that reason, of unusual interest. Mr. Watson finds that there is a definite critical voltage with direct current just as with alternating current, and also that the value of the critical voltage is the same in each case. The presence of water vapor, strangely enough, does not affect the maximum voltage or produce any extra leakage from a clean wire. Unfortunately, however, Mr. Watson adds that transmission wires do not behave like perfectly clean wires, and that in his experiments with direct current, in presence of water vapor, considerable losses occurred, especially at low voltages.

These experimental results are a distinct addition to our knowledge of high tension conditions, even if they do not solve the problem.

## The New Telephone Secretary

As foreshadowed in the last issue of the "Electrical News," the Canadian Independent Telephone Association has appointed a secretary who will devote his entire time to the organization and co-ordination of the independent telephone system in Canada. The choice is, without doubt, a most happy one and the Association is to be congratulated that a man of Mr. Dagger's ability and telephone experience was procurable at this critical moment, when the Independents have, so to speak, thrown down the gauntlet to the Bell Company. In spite of the resolution passed at the annual meeting of the Independents, recent reports are to hand of individual companies, here and there over Canada, making reciprocal arrangements with the Bell Company, and the new secretary's first and hardest task will be to enlist the support of every independent company in their struggle against what they will be taught to look upon as their common enemy.

For this task Mr. Dagger would appear to be particularly well fitted. A practical business man, a practical telephone man, a born fighter, a man of wide ex-



perience in the financial details of telephone operations, as evidenced by his active participation in the negotiations which placed Manitoba and Saskatchewan in possession of their provincial systems, we are mistaken if he does not initiate, for the Independent cause, an era of great prosperity. Canadians everywhere will watch developments with the greatest interest, not from any feeling of antagonism whatever towards the Bell Company, but because competition in this, as in other lines of commercial activity, spells more efficient service. To the countryman especially the advent of the Independent telephone is of inestimable value, and it is scarcely possible to foresee the far-reaching influence, on the development of the rural districts of Canada, that may result from the vigorous campaign that may now be said to have been inaugurated.

## The High Voltage Line

Details are to hand describing the operation of the Grand Rapids, Muskegon, transmission plant, the first in the world to reach the 110,000 volt limit. The plant is described as singularly successful in securing effective and continuous service, better in that respect than most plants at half the voltage. These facts are most reassuring in view of the Ontario Government's proposed transmission at the same high voltage, and should set at rest any fears that may have been entertained that the Government's action is more or less of an experiment. The advances in high voltage transmission, in very recent years, have been nothing short of marvellous, and one is led to ask where it is going to end. In this connection it may be said that a limit of 150,000 volts has been fixed by engineering students as the maximum, above which it would require abnormally large wires, and it has been calculated that for a potential of 250,000 volts a wire one and one-half inches in diameter would be required. Aerial support of such a wire would become a difficult matter, and it has been suggested that a large hemp core overlaid with a casing of either copper or aluminum would prove a more satisfactory conductor for such high tension.

## Compulsory Use of Iron Conduit

In another column will be found a reprint of the by-law recently passed by the City of Winnipeg council, demanding, within its more congested areas, that practically all electric wiring shall be carried within iron conduit. There can be no doubt that this departure will assist materially in safeguarding the city against destructive fires. Winnipeg, in taking this step, is but following the practice of a large number of American cities, but we regret to add that Canadian cities have been slow to legislate like measures of prevention. One by one individual enterprises are becoming convinced of the necessity of installing the modern metal conduit system, but these isolated cases generally represent firms where caution is always a characteristic and where, in consequence, trouble is unlikely to occur under any system. Whatever precautions individual companies may take, the fact still remains that one single unsafely wired building will constitute a menace to the safety of a whole neighborhood. It is the one or two manifestly unsafe buildings which, generally speaking, the Underwriters' Association is unable to control, that make the demand for legislation so urgent. These facts being recognized by the public at large, it is unlikely that any considerable number of property owners in the central portion of a great city would seriously object to such a by-law on the score of expense.

## Toronto Section American Institute Electrical Engineers

Following an informal luncheon at the St. Charles, the annual meeting of the Toronto section of the American Institute of Electric Engineers was held in the rooms of the Engineers' Club, 96 King street west, Toronto, on Friday, October 15th. The executive committee submitted for final vote, a list of nominations for officers for the ensuing year, and the following were elected: Chairman, Harold W. Price; Vice-Chairman, Ed. Richards; Secretary, W. H. Eisenbeis; Executive Committee, A. L. Mudge, R. J. Clark, H. A. Moore, F. A. Gaby.

Meetings will be held throughout the coming year on the third Friday of each month, and as an earnest of interesting topics to be discussed the secretary announces that at the next meeting, Nov. 19th, a paper on "Tungsten Lamps" will be presented by one of the engineers of the National Electric Lamp Association, of Cleveland, Ohio. The following month, Mr. P. W. Southam, chief engineer of the Hydro-Electric Power Commission, will read a paper.

### Characteristics of Transmission Lines

The subject of "Transmission Line Characteristics" was discussed in a comprehensive paper by Mr. A. J. Soper, chief electrical inspector for the firm of Smith, Kerry & Chace. Mr. Soper dealt with the phenomena limiting the amount of power that can be economically transmitted along a wire. This quantity is regulated by resistance, skin effect, self induction, mutual induction due to neighboring currents, and capacity effects due to a pair of wires acting as a condenser. These were taken up in turn by the speaker, who defined each unit and briefly outlined the method adopted for calculating its numerical value.

A particularly interesting and valuable part of the paper was a discussion of the electro-magnetic and electrostatic field effects on the design and operation of a transmission line, taking as an example a telephone line installed on the same poles with a three-phase transmission line. A formula was deduced showing that the value of the co-efficient of mutual induction between the telephone and the power lines, due to the electro magnetic effects, is decreased by placing the wires of each system as close together as possible and by increasing the distance between the two circuits. Another method is to transpose the two telephone wires so as to expose each to the same amount of resultant field. This applies only under normal conditions. Unbalanced conditions, such as grounds, may produce sufficient induction to prevent conversation over the line.

In the consideration of electrostatic effects, it was shown that the charges on the three power wires tend to neutralize one another. In the case of one line being grounded the static charge is no longer balanced, and very high potentials may be produced in the telephone wires. Since the charges carried by the two telephone wires are of the same sign, transposition is not effective here. Good results are obtained, however, by transposing the power wires spirally, a third of a turn at each transposition.

Summed up, the general line of attacking the disturbance problem is as follows:

- (1) Increased separation between the two circuits and diminished spacing between the conductors in each.
- (2) Altering the sensibility of the telephone apparatus.
- (3) Neutralization by transposition, may be of telephone wires or of power wires.
- (4) Improved insulation of telephone wires.



### Surges in the Transmission Circuit

Sudden changes in the transmission circuit often give rise to surges or sudden rises of potential due to inductance and capacity of the line. There being no other outlet, this energy must be absorbed by the capacity of the system. After the system, acting as a condenser, becomes charged, it immediately discharges again into the line, the energy appearing once more in the form of magnetic field. This repeats itself indefinitely until the resistance of the line dissipates all the initial energy of the field. The speaker illustrated this point by calculating, from formulæ which he deduced, that if a current of 200 amperes be broken by a switch in air, the rise in voltage will approximate 70,000 volts. In systems carrying a large amperage at low pressure the induced e.m.f. may be very much greater. Records of actual experiments on these potential rises, where the speaker used the oscillograph to record the results, were shown in diagram. The value of the induced e.m.f. depends on the point in the current wave at which the circuit is broken. To meet these conditions oil switches are designed which draw out an arc between contact points. In this manner by increasing the resistance the short circuit current is considerably diminished and the voltage rise at break is decreased in the same ratio. Another cause of surges is sudden change in the electrostatic field, which also results, at a limiting potential, in atmospheric discharge (corona effect).

### Voltage Regulation of the Line

The main factor affecting the length of line and the amount of power that can be transmitted is the voltage regulation of the circuit, usually expressed as a percentage of the receiving voltage. This depends on the six factors, resistance, inductance and capacity of the line, frequency, current, and power factor of the load. Capacity being small, may generally be neglected. The speaker here outlined various methods of calculating the regulation of transmission lines, explaining fully the use of the chart recently published by Professor Herdt. In this connection some original tables were presented, which have but recently been prepared, for the rapid calculation of transmission lines.

[Owing to lack of space the tables referred to above, with their explanation, are held over for the next issue, when we hope to be able to present this interesting matter in concise form under the author's own name.—Ed.]

### Royal Electric Company vs. Hamilton Power Company

The case of the Royal Electric Co. v. Hamilton Electric Light & Cataract Co., which recently came before the Ontario Court of Appeal, was an appeal by the defendants and cross-appeal by the plaintiffs from judgment of Mr Justice Anglin on an action which was brought to recover the price of certain machinery supplied by the plaintiffs to the defendants, under contracts of conditional sale, by the terms of which the property was not to pass until payment, or, in the alternative, for a return of the articles and payment of the difference between the purchase price and the proceeds of a sale of the articles so returned. The defendants denied acceptance of the goods, denied that they were in accordance with the contracts, and counterclaimed for damages for breach of the contracts, and for moneys paid on account thereof. The Court of Appeal found that it was the duty of the plaintiffs to supply generators of the quality and capacity and within the time limited and provided in the contract. This they had not done. The defendants definitely enough assumed the position that they would not accept the articles in question; and their

continued use thereafter and until the reconstruction may well, on the evidence, be assumed to have been at the instance and with the consent of the plaintiffs, in the hope, for all parties were apparently acting in good faith, that the machines might in the end be made satisfactory. The substantial defect in the machines in question, as found by Anglin, J., is that, whereas they were entitled to get generators which at full load would have a temperature rise of not more than 40 degrees and on an overload of not more than 45 degrees, the machines actually delivered and accepted exceeded these temperature rises by 15 degrees and 17½ degrees respectively. The machines have been delivered and accepted, and the question, in so far as this item of damages is concerned, may conveniently be the simpler one of what is the difference in value between machines which would comply with the contract and specifications, and the defective machines actually delivered. The plaintiffs should restore the machines to the defendants at the place whence they were taken, free of all expense, upon payment, in the same condition as they were in when tendered after the overhauling. And, in default of payment, the relief asked by the plaintiffs of sale and payment of the loss, if any, should be granted. Interest should only be calculated upon the value of the machines as found by the learned referee after making all proper reductions, and not upon the contract price. And there should be no interest upon the price of the machines from the time the plaintiffs took possession of them until they tendered them back. And the damages should in form be in general terms, and not as in the formal judgment, although not dissenting from the principle upon which damages have been awarded and directed to be computed, by Anglin, J. Subject to these conditions, the appeal was dismissed with costs, and the cross-appeal was also dismissed, but without costs.

### Uniform Rate Throughout City

The special committee of the Toronto city council appointed to look into the question of the telephone rates being the same in all parts of the city, instead of a double charge, as made at present in some of the outlying districts, held a meeting recently and decided to instruct the City Solicitor to prepare a case for presentation to the Board of Railway Commissioners for Canada. The intention is to apply for an order for a flat rate throughout all parts of the city. This draft application will be submitted to the committee, which will then decide as to whether or not a good case has been made out. The rates in Ward Seven are higher than those of the other six wards, and the desire is to have them uniform. Mr Francis Dagger will assist the city in the capacity of telephone expert in connection with the case.

Comparing three systems of lighting railway trains with electricity—with a steam driven dynamo and batteries, with storage batteries charged at the terminal, and with axle driven dynamos and batteries—Mr. O. W. Ott recently stated at Chicago that the costs worked out as follows:

	Steam Dynamo	Storage Cells	Axle Dynamo
Cost per car, per yr, opera'n..	\$533.18	\$599.61	\$631.33
1st cost per car, equipment..	874.24	1,073.50	1,673.50
Weight equipment per car, lbs.	2,075	3,800	4,900

The actual cost of maintaining electric light on more than 150 cars on a prominent railroad in the United States during the year 1908 was found to average \$524 per car, and the average cost of equipment was \$1,311 each.



# Montreal and District

"Electrical News" Office,  
Board of Trade Building,  
October 27th, 1909.

Mr. R. J. Hiller has been placed in charge of the supply department of the local offices of the Canadian General Electric Company. He succeeds Mr. A. P. Horner, who has been transferred to the supply department of the company's Calgary office.

Mr. R. F. Hayward, general manager and chief engineer of the Western Canada Power Company, Vancouver, was in Montreal recently. Construction work on the company's proposed development will be pushed rapidly ahead. Mr. Hayward states that the general engineering scheme that will be followed in the erection of their plant has practically been decided upon.

Mr. Edward T. Mug, who was for some years with the Bullock Electric & Manufacturing Company, of Cincinnati, Ohio, and until recently with Allis-Chalmers-Bullock, Limited, Montreal, has taken charge of the Canadian Crocker Wheeler Company's office at 41 Street Railway Chambers, Montreal, under the direction of Mr. R. A. Stinson, vice-president of the company.

The Intercolonial Railway Company are equipping a new steam generating plant at Riviere du Loup. The Robb Engineering Company, Limited, Amherst, N.S., have been awarded the contract for the installation of the engine and will supply one of their high speed vertical type engines. The generator, exciters and switch-board equipment will be installed by the Allis-Chalmers-Bullock, Limited.

Mr. Donald S. Barton, general manager and chief engineer of the Canadian Electric Light Company, Levis, Que., was in Montreal recently. Mr. Barton's company contemplate the installation of an auxiliary plant of either steam or gas to look after the company's load during the summer period of low water.

Mr. F. Goodwyn, vice-president and manager of the Midland Electric Company, has removed to Hamilton, Ontario. This move is the result of the amalgamation of the Midland Electric Company with the Canadian Tungsten Lamp Company, Limited, of Hamilton. Mr. Goodwyn was one of the best known men in the electrical supply business in Montreal and was proprietor of the old Midland Electric Company before its incorporation as a limited liability company, and now assumes a responsible position with the newly formed company. A host of good wishes follow him to his new territory.

Mr. Frederick Adams, managing director of the English firm of G. Pearson & Sons, met the directors of the Mexican Northern Power Company, Limited, in Montreal recently and signed a contract for the development of a large power site in the northern part of Mexico on the Conchos river, to supply power and light to the mines in that territory. The contract involves an outlay of five million dollars.

The Canadian Light & Power Company recently closed contracts with the Eugene F. Phillips Company and the Wire & Cable Company for the copper requirements of their transmission line which will be erected between St. Timothee and Montreal.

The annual meeting of the Montreal & Southern

Counties Railway Company was held recently in Montreal. It was intimated at the meeting that the line would be in operation by November 1st. The new steam generating plant has been completed and the work of finishing the roadway over the Victoria Bridge is all that remains to be done. The company were recently granted a franchise to operate in Montreal South, and the contract for the grading of this section of their line, which will extend from St. Lambert to Longueuil, has been let to Messrs. Brennan & Carney.

The Canada Paper Company, sales office 70 McGill street, Montreal, are completing some radical changes to their big plant at Windsor Mills, Que. Instead of the present steam equipment, arrangements are being made to have their mill operated by electric power. This will be supplied by the Shawinigan Company at a pressure of 2,200 volts. The Canadian Westinghouse Company have installed one 300 h.p., two 75 h.p., and three 30 h.p. 2,200 volt, three-phase motors, and also two 15 h.p. and three 10 h.p., 440 volt motors.

It is altogether possible that the building and the equipping of a modern power plant to supply the Montreal harbor with its power and lighting requirements will form part of the general scheme which the Harbor Commissioners have in view and for which they have asked the Government's support.

The pay-as-you-enter cars, the invention of Messrs. Ross & McDonald, of the Montreal Street Railway, are used now very extensively in Canada and the States. In the latter country these cars are in use in no fewer than forty cities. The latest Canadian concern to introduce this style of car is the British Columbia Electric Railway Company. Calgary, Edmonton and Halifax are also using the pay-as-you-enter car system.

The question of the illegality of freight traffic by the Montreal Street Railway is still a live issue, and the city threatens to obtain an injunction restraining such traffic. Inasmuch as outlying districts are getting their freight supplies with less delay and at lower cost, the company's attitude has many supporters. The city, too, has placed itself in a more or less anomalous position by accepting its share of freight receipts, which under the franchise now amounts to 15 per cent. of gross earnings.

Considerable work has already been done on the Dominion Light & Power Company's plant at Maisonneuve and the company hope to be in a position to distribute power early next year. The primary equipment will consist of a 1,150 h.p. installation of Hornsby Stockport suction gas engine units, supplied by the Colonial Engineering Company, of Montreal. The generators will be of the three-phase, 60 cycle, 2,300 volt, revolving field type, to be built by the Allis-Chalmers-Bullock Company.

Mr. F. J. Gleason, consulting engineer for the Walpole Rubber Company, Limited, of Canada, Granby, Que., was in Montreal recently. Mr. Gleason states that their new factory is practically completed and is being equipped as rapidly as possible. The company will manufacture all kinds of rubber splicing, insulating and friction tapes, miscellaneous rubber sundries, varnishes and insulating compounds. The generative power of the plant will be furnished by a water power equipment. During Mr. Gleason's visit to Montreal he closed contracts with the Wire & Cable Company, the John Forman Company,



and the Northern Electric & Manufacturing Company for the various electrical supplies required by the company. The sales offices of the Walpole Company are located in the Eastern Townships Bank Building, with Mr. F. E. Baldwin in charge.

The Western Canada Power Company, through their purchasing agents, the Montreal Engineering Company, recently awarded the contract for their complete requirements of water wheels and turbines to the Escher-Wyss Company, of Zurich, Switzerland. The Allis-Chalmers-Bullock, Company, Limited, will supply a 450 k.w. generator to be installed in their temporary construction plant. Tenders for the balance of the electrical equipment that this company will require have been received, but no action regarding these will be taken for some time. Tenders are now being called for the necessary supply of wire.

No agreement has been reached yet between the city and the Montreal Light, Heat & Power Company regarding the street lighting problem. The company are at present supplying the lights on a special arrangement with the city council.

#### Electrical Notes from McGill

The electrical classes at McGill University are particularly well filled this year and the facilities which the new McDonald Engineering Building provide are more widely appreciated than ever. Prof. Herdt is in charge of the electrical department and has 28 fourth year and 32 third year men. The second and freshmen years are also well filled.

The first meeting of the McGill Electrical Club was held last Thursday under Prof. Herdt's patronage. This is the second year of the club's existence, and the members intend to make a series of visits, during the present college year, to the various interesting electrical works around the city. At this meeting the following officers were elected: Honorary President, Prof. Herdt; Honorary Vice-President, Prof. Christie; Councillors, Alford, Vinet, McDairmid, R. H. Reid, G. K. Bright, and M. J. McHenry. At a later meeting the following executive were elected: President, M. J. McHenry; Secretary, W. P. Smith; Treasurer, R. Scrivener.

#### Standard of Insulated Wire

We print below, in part, a letter addressed by the Lowell Insulated Wire Company, of Lowell, Mass., to Mr. F. A. Cambridge, City Electrician of Winnipeg, in reply to his letter published in the October issue of the "Electrical News."

It is, we believe, enough for us to say that we did not read into Mr. Cambridge's letter any suggestion of reflection on any particular manufacturer.

Lowell, Mass., October 12, 1909.

Mr. F. A. Cambridge, City Electrician,  
Winnipeg, Man., Canada.

Dear Sir,—Our attention has been drawn to a letter in the recent issue of the "Canadian Electrical News" under your signature.

You inferred that because of price, and the fact that we do not issue factory inspection stamps, which are unnecessary in addition to the National Board of Fire Underwriters' approval, that the wire is not such as we are putting out in this country; but in this you are mistaken, as the wire is absolutely the same in every respect, and according to standard, and is now in use in nearly all the large cities in the United States and Government yards; and the only explanation we can offer of how we find it possible to sell wire in Canada plus the duty and freight, is the absurdly high prices your Canadian manu-

facturers charge for their product. The price we get for our wire in Canada is the same as we get this side of the line, and the same as all the other first-class United States manufacturers get, whether stamped or unstamped.

If you wish to further the electrical interests on your side, we would suggest that you get the Canadian insulated wire companies to reduce the price to the Canadian jobber to a reasonable figure, which would be a blessing to both the jobber and consumer, and give a decided impetus to electric lighting generally on your side, and forever cut out the manufacturer of the United States.

Trusting you will look for a moment to our side of the question, which is also the Canadian consumers' side, and assuring you that our object is to do a legitimate business with your country, we beg to remain.

Yours very truly,

Lowell Insulated Wire Co.

#### Sale of South Western Traction Company

The South Western Traction Company, operating between London and Port Stanley, have sold out their interests to Mr. J. E. McDougall, of London, who represents a syndicate of Toronto, Hamilton and London capitalists. The price paid is \$535,000.

The railway is 28 miles long, about one-half being on private right of way and half on public highways. Power is developed by steam, the total capacity of the generators being 800 h.p. The rolling stock includes 12 passenger coaches and a number of freight cars. It is said the road will be extended to Aylmer and Delaware.

#### Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Electrical News" may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

1235. Electrical goods—A firm of engineers' agents in the north of England would like to receive inquiries from Canadian firms requiring any class of mechanical or electrical engineering goods to whom they could be of service.

1245. Rubber tires, jointing tapes, etc.—A Lancashire firm manufacturing rubber tires, rubber mats, rubber gloves, ebonite, electrical cables, jointing tapes and other accessories for the electrical, motor, carriage, chemical, etc., industries, is desirous of entering the Canadian market.

1298. Power plants.—A correspondent in London is willing to find capital for the erection of electric lighting and power plants in Canada and would like to get into touch with towns willing to grant concessions.

1329. Tramway poles, etc.—A firm of iron and steel manufacturers in the English midlands would like to hear from municipalities and other sources in Canada likely to be interested in the purchase of electric tramway poles, including bracket arms, bases, etc.

#### A New Canadian Factory

A new company, under the name of the Canadian National Carbon Company, has been organized to supervise the Canadian business of the National Carbon Company, of Cleveland, Ohio. It has also been decided to build a large factory in Toronto, where something like 300 hands will be employed. The articles of manufacture will be dry batteries and carbon products.



## Personal Mention

The appointment of Major William W. Pope, R.O., assistant general solicitor to the Grand Trunk Railway, to the office of solicitor and secretary of the Hydro-Electric Power Commission of Ontario, was recently announced. The appointment is very popular in Montreal, where, during his tenure of office, the Major has made a large circle of friends. Major Pope was born in Compton county, Que., and as a lad entered the service of the Boston, Clinton & Fitzburgh Railway at Boston. He later joined his brother in Belleville, entering the lumber business there, but soon abandoned this to take up the study of law with the late George Dickson, K.C. In August, 1881, he entered the service of the Grand Trunk Railway, as assistant to the late John Bell, K.C., but latterly he has been associated with W. H. Biggar, K.C. During his service with the Grand Trunk Com-



Major Pope, R. O.

pany he has had a wide experience in dealing with people and municipalities, which will prove exceedingly valuable in his new position as solicitor and secretary of the Commission. Major Pope has always taken a great interest in military affairs, and at present holds the rank of Brevet Lieutenant-Colonel of the 15th Argyle Light Infantry.

Mr. F. Dagger has been appointed secretary of the Canadian Independent Telephone Association.

Mr. J. W. Crosby, general manager Halifax Tramway Company, of Halifax, N.S., was in Toronto a few days ago and gave the "Electrical News" a call.

We note the marriage of Mr. John F. S. Madden to Miss Irene Henderson, of Sudbury. Mr. Madden is a son of Mr. Geo. F. Madden, manager of agencies for the Canadian General Electric Company.

The B. C. Electric Ry. Company has recently added to their executive strength by the appointment of Mr. Allan Purvis as manager of their new Fraser Valley branch, running from New Westminster to Chilliwack. Mr. Purvis has been with the C.P.R. as superintendent

of the Kootenay lines for a number of years and has made many friends; who regard his removal with great regret. Headquarters for Mr. Purvis will in future be New Westminster.

We wish to correct an error, appearing in our last issue, in the personnel of the officers of the Canadian Tungsten Lamp Company, of Hamilton. Mr. W. H. Ginder will occupy the double office of president and managing director, with Mr. F. W. Gates as vice-president. The secretary of the new company is P. D. Crerar, K.C.

Mr. Benjamin J. Harpell has opened offices at 24 Aikins Block, Winnipeg, for the purpose of carrying on business in electrical machinery and supplies. Mr. Harpell is selling agent for the Century Electric Company, of St. Louis; Federal Electric Company, of Chicago; Ideal Electric & Manufacturing Company, of Mansfield, O., and the Machen & Mayer Electric Company, of Philadelphia. A large stock of supplies will be carried in Winnipeg.

Mr. H. G. Nicholls, late of the Canadian General Electric Company, of which he had been secretary and assistant general manager, severed his connection with that company to enter business on his own account. This event was made the occasion recently by his friends of the head office staff of the company, of presenting him with a handsome loving cup. The presentation was accompanied by an address setting forth in hearty terms the high regard and universal esteem in which Mr. Nicholls was held by his associates.

The "Electrical News" appreciates the loss the Canadian General Electric Company is sustaining, but trusts that a corresponding advantage will accrue to Mr. Nicholls himself, to whom we extend hearty good wishes for continued success.

[Owing to a compositor's error in our last issue, the paragraphs in the above personal notice were transposed. We reprint the item as it was originally written.—Ed.]

## Coaticook Extensions

The town of Coaticook, Que., is about to develop a new site on the Coaticook river a short distance below its present power house. Plans have been adopted for a stone and concrete dam 32 feet high, stone and concrete power house, 2 horizontal turbine wheels, direct-connected generator, direct-connected exciter unit, with provision for a duplicate unit. The total head will be  $41\frac{3}{4}$  feet and when completed will more than double the present capacity.

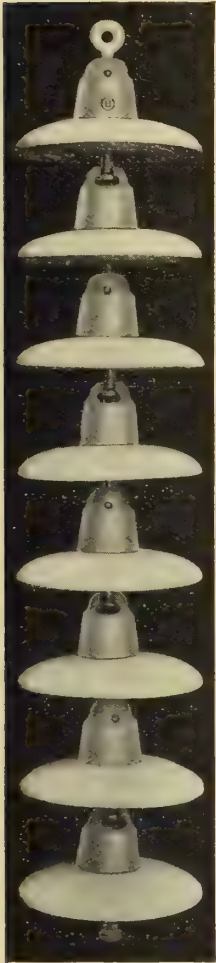
The transmission lines will all be reconstructed, and the present 550 volt, d.c. power circuit disconnected, as will also be the present single-phase lighting circuits, and d.c. arc system. All will be converted into a 250 k.w., three-phase, 60 cycle, 2,200 volt, light and power system, the streets lighted by a tungsten series incandescent system, with possibly a few a.c. arcs in circuit. A phase balancing board will be installed in the upper power house and the present single-phase system used for periods of dry water and auxiliary purposes.

Contracts have been awarded as follows: Concrete and stone dam, W. J. Welsh; water wheels, governors, tube, etc., Jenckes Machine Company; generator, exciter and switchboard, Allis-Chalmers-Bullock Company; series tungsten street lighting, Canadian General Electric Company.

F. C. Davis prepared the plans, and is engineer and superintendent on this construction work.



## High Tension Porcelain Insulator



Suspended Type High Tension Insulator.

The development of long distance transmission of electric power at high voltage has in the past few years made it necessary for the porcelain manufacturer to design porcelain insulators which will withstand higher voltages than it is practical to manufacture in the pin type of insulators. The increase in voltage has suddenly jumped from 65,000 or 70,000 volts to 100,000 volts and over, bringing with it a demand for larger factors of safety. Cost, size, weight and efficiency are points to be carefully considered, and with this in view, the suspended type of insulator shown in the accompanying cut, has been developed.

This insulator is the one recently chosen by the Hydro-Electric Power Commission of Ontario for operation on their transmission line at 110,000 volts, after the most exhaustive investigations and competitive tests ever conducted on this continent. It is manufactured by the Ohio Brass Company, Mansfield, Ohio, and possesses the highest efficiency possible, with minimum weight and cost, this result being due to the design and proper distribution of the porcelain.

The design of the lower surface of each porcelain shell is such as to confine the static discharges to an area im-

mediately surrounding the forged stud, until the voltage impressed has approached that of flash-over. The operation of the insulator is exceedingly quiet up to flash-over. Only the best grade of Portland cement is used in assembling the parts. The electro-static capacity is small, as each unit consists of a single porcelain shell (in place of several shells), a malleable iron cap and forged steel pin. The mechanical breaking strain of this insulator is approximately 9,500 lbs. to 10,000 lbs., which allows ample factor of safety under normal conditions.

The weight of each unit complete with cap and forged stud is  $10\frac{1}{4}$  lbs., and when assembled, the distance between edges of adjacent porcelain shells is  $6\frac{1}{4}$  inches. The length of two assembled units, from centre of eye in top unit to lower edge of forged pin in lower unit, is  $13\frac{9}{16}$  inches, and each unit added increases the length by  $6\frac{1}{4}$  inches.

Each assembled unit tested dry will flash over at approximately 95,000 to 100,000 volts, and under a heavy precipitation of .3 inch to .4 inch of water per minute at an angle of 45 degrees, will flash over at approximately 50,000 to 55,000 volts, and when tested under oil, punctures at approximately 120,000 to 150,000 volts. In an assembled condition of two units with a separation between the porcelain shells of  $6\frac{1}{4}$  inches, the flash-over, dry, is approximately 175,000 volts, and each unit added increases the flash-over approximately 75,000 volts; two units under .3 to .4 inch precipitation per minute, flash over at approximately 110,000 volts, and each additional unit increases the flash-over by approximately 45,000 volts.

Each insulator is tested to 6,000 lbs. before packing and is given a flash-over test after the mechanical test, which is in addition to a severe electrical test before assembling.

## Compulsory Use of Iron Conduit

The municipal council of the city of Winnipeg recently considered and passed a by-law requiring the use of iron conduits for all kinds of electrical wiring in all buildings within a defined central area, excepting only dwelling houses and private barns. The regulation also applies to certain buildings outside of this area, such as churches, schools, public halls, etc. The by-law, which comes into force on Jan. 1, 1910, is worded as follows:

(a) "No building situated within the boundaries of the underground wiring district (defined) of the city of Winnipeg, shall be hereafter wired for the purpose of using electric light, heat or power unless the conductors are encased throughout in approved metal conduit or consist of approved armored cables, or, in the case of exposed surface work on walls or ceilings, are encased in approved metal conduit or approved metal moulding. Provided that this rule shall not apply to frame or brick dwelling houses or private barns in said district".

(b) "All the buildings having basements (excepting dwelling houses or private barns) hereafter wired for electric light heat or power purposes and situated within the said underground wiring area, shall have the main feeders so arranged that connection can be readily made between same and the electric light or power service wires that may hereafter enter such basements. The said feeders shall run in basement to the front or rear basement wall, whichever is selected as the most suitable point for the service to enter from the present aerial lines. From the said basement wall a conduit shall extend in a vertical direction to a suitable point above the ground and which shall terminate in an approved service cap. This vertical conduit may be carried either on the exterior surface of the wall or in the interior of same. If the latter, the main line cutout and switch shall be placed as close as possible to the point of entrance of service, but no higher than eight feet from the floor, and in the former case the main line cutout and switch shall be placed at the point where the conduit is brought through the exterior wall into basement. In either case the cutout and switch is to be enclosed in an approved iron cabinet. In the case of minor additions or alterations or repairs to any existing system the City Council may modify the above requirements".

(c) "No building hereinafter designated, situate and being outside of the underground wiring district (defined) shall be hereafter wired for the use of electric light, heat or power unless the conductors are encased throughout in an approved iron conduit or consist of armored cable, or if carried on the surface of walls or ceilings, are either encased in approved metal conduit or approved metal moulding; viz.: all churches, schools or colleges seating over 100 persons; all apartment buildings; all public halls, lodge rooms or dance halls, whether an admission fee is charged or not; all woodworking shops or factories; all factories or buildings where especially inflammable goods or material is handled or stored; all packing houses or abbatoirs. Also in the wiring of basements of all buildings other than in dwelling houses or private barns."

Vandeleur & Nichols, electrical and constructional engineers, Toronto, have opened an office at 110 Cannon street, E.C., London, England, which will be in charge of P. F. Brittain. Mr. Vandeleur is still in England making extensive business connections for the firm.



# High Potential High Frequency Experiments

A Description of Interesting and Original Experiments Performed by the Author with specially designed Condensor for High Frequency Discharge

BY FRANK P. VAUGHAN

The production of high potential, high frequency currents by the use of condenser discharges is by no means new. The following apparatus and experiments may be of interest, however, as they are becoming more and more of commercial importance, due to their use in wireless telegraphy, etc. For the benefit of those readers to whom some of the terms used in the following article may not be familiar, the writer will endeavor to explain some of them.

Alternating currents met with in commercial use are, relatively speaking, of low frequency. If, however, the frequency were from 1,000 to 100,000 they would be known as high frequency currents. When the frequency rises to a value of a million or so, they are generally called electric oscillations. When an alternating current of very high frequency exists in a circuit and continues uninterruptedly it is usually called a persistent or undamped electric oscillation (such as are used in wireless telephony).

In the following experiments, however, we are concerned with an alternating current of very high frequency, which consists of separate groups of alternating currents, each group beginning with the same amplitude but then damping down more or less rapidly to zero, and, after an interval of rest, beginning again. These are known as damped electric oscillations. The rate at which the amplitude dies away in each train is called damping. A train of very few oscillations, say five or six, is called a highly damped train, and 100 or more a feebly damped train.

These high frequency currents do not follow the same laws as low frequency currents, and when using thick copper wires to convey high frequency currents, the effective resistance may be very much greater than for continuous or low frequency currents. On the other hand, if the wire is of small diameter, then even for high frequency currents this increase in resistance, due to the concentration of the current at the surface of the wire, is not very serious. For this reason, stranded wires made up of twisted fine insulated copper wires should be used. There is another point, however, in connection with the above. When a wire is coiled into a helix of many close turns, its high frequency resistance is considerably greater than for the same wire stretched out straight.

Inductance, which, with capacity, plays such an important part in alternating current work, may be described as having a certain kind of inertia, analogous to the inertia of water in a circuit of pipe. If an electric current in a circuit is made to change in value, a portion of the electromotive force acting upon the circuit must be used to cause the current to change. In the same way a force over and above that required to overcome frictional resistance must act upon a moving body to accelerate it. The inertia of a body is measured by the force required to accelerate it at the unit change in speed per second, and the inductance of a circuit is measured by the electro motive force required to cause a current in the circuit to change at the rate of one ampere per second. The inductance of a circuit depends on its geometrical form and is determined by the amount of linkage of flux that takes place within itself when one ampere flows in the circuit. The inductance is

therefore increased by closely coiling the circuit. A circuit is said to have an inductance of one henry when one volt (over and above that required to overcome the electrical resistance) will cause the current to change at the rate of one ampere per second. The inductances met with in practice are generally small and, in high frequency work, of an order of thousandths and millionths of a henry.

Capacity (electrostatic) may be defined as the quantity of electricity which must be imparted to a given body or conductor as a charge, in order to raise its potential a certain amount. The capacity of a condenser or conductor is not unlike the capacity of a vessel filled with a liquid or gas. A certain quantity of liquid will fill a given vessel to a level, dependent upon the size or capacity of the vessel. In the same manner a given quantity of electricity will produce in a conductor or condenser a certain difference of electrical level or difference of potential, dependent on the electrical capacity of the conductor or condenser. A condenser whose potential is raised one volt by a current of one ampere flowing into it for one second has a capacity of one farad. Like the henry, however, this unit is much too large for practical use, and in high frequency work the capacities are of an order of thousandths and millionths of a farad. The discharge of a condenser through a circuit possessing self inductance or electrical inertia under certain conditions is oscillatory, that is to say, the electricity flows backwards and forwards in the circuit several times before the condenser becomes finally discharged. According to Dr. Oliver Lodge, the rate of oscillation for a pint size Leyden jar or condenser is ten million per second. For jars of larger capacity the rate is less rapid.

Electric resonance.—If an oscillatory current has a periodic or alternating electro-motive force set up in it, and if the frequency of this e.m.f. agrees with the natural frequency of the current, then an immensely greater current will be produced than if the periods do

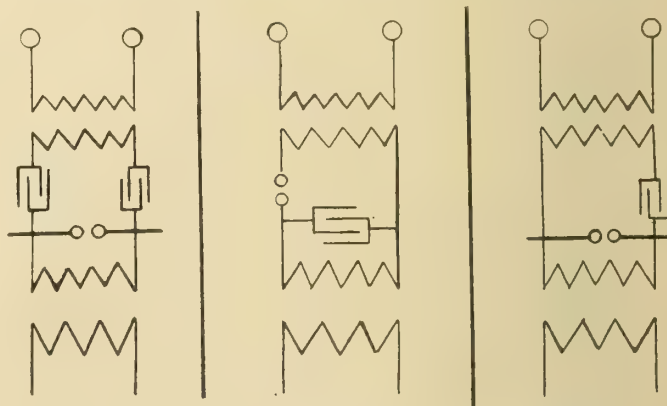


Fig. 1.

Fig. 2.

Fig. 3.

not agree. This increase in amplitude of the alternating current created in the circuit by exact syntonizing or tuning the frequency of the impressed e.m.f. with the natural frequency, is said to be due to electric resonance.

It is a familiar experiment that we can set up a very considerable amplitude of vibration in a pendulum by administering to it small blows, provided these are timed to agree exactly with the natural period of the



pendulum. In the same manner, oscillations of great amplitude can be created in a heavy elastic beam supported at both ends, by very gentle blows given at the right intervals in the centre. The earliest methods of producing high frequency oscillations were probably due to Lord Kelvin (but are better known by the striking experiments of Tesla), who showed that if a condenser be charged to a high potential and discharged through a circuit having inductance (or electrical inertia) and low resistance, a train of damped oscillations would be created at every discharge of the condenser. As a mechanical analogy, we may compare the charged condenser to a

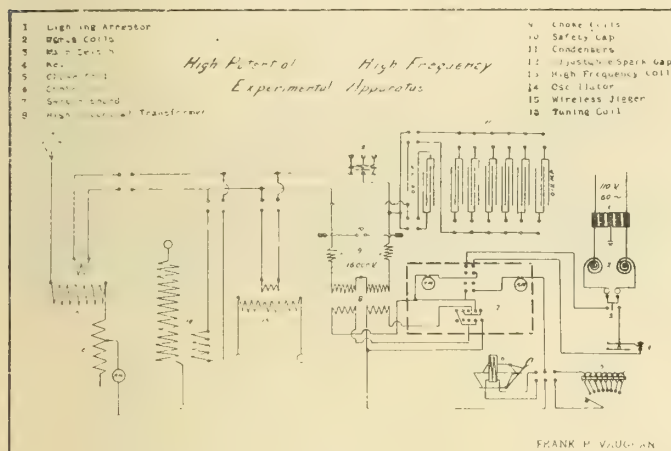


Fig. 4.

weight attached to a spring, which has been pulled away from its position of rest. To discharge the condenser, let go the weight and it begins to oscillate backwards and forwards, and after marking a greater or less number of oscillations, finally comes to rest. The number of oscillations per second will depend upon the strength of the spring and the mass of the weight, which correspond with the capacity and self induction in our electrical circuit. The number of oscillations before the weight finally comes to rest is determined by the friction which tends to stop the weight, or by the resistances and other losses in the electrical circuit.

It is necessary to arrange the circuit for the production of trains of damped electric oscillations by condenser discharges, so that the inductive circuit is in series with the condenser. This usually consists of one circuit of a transformer, containing no iron, called an air core transformer. Two circuits are wound one over the other, and highly insulated from each other; one of these is called the primary, the other the secondary. The primary circuit is arranged in series with a condenser and spark gap. This being the circuit in which electric oscillations are set up by the discharge of the condenser, the oscillations in the primary induce other oscillations in the secondary, and if the secondary has a greater number of turns than the primary, the secondary voltage will be greater than that of the primary in a known ratio. Professor Fleming determined experimentally that if the two circuits are loosely coupled, that is, the primary and secondary circuits being more or less widely separated and tuned in resonance, the damping being negligible, the ratio of transformation is determined entirely by the capacities in the two circuits; but when the circuits are closely coupled but not tuned in resonance, the ratio is determined by the relative number of turns on the two circuits. The apparatus may be connected in several ways, as in figs. 1, 2, and 3, although the results obtained differ but little.

Fig. 4 shows the general arrangements of circuits and

apparatus used by the writer, the connections being the same as in fig. 2. 60 cycle alternating current is taken from the local company's lighting mains at 107 volts. A low equivalent lightning arrester, 1, and Wurts choke coils, 2, are used to prevent any high frequency discharges getting out on the line. 3 represents the main switch and fuses; 4, telegraph key; 5, open magnetic circuit choke coil, the number of turns being adjustable; 6, adjustable magnetic circuit choke coil; 7, slate switch-board with fuses, main switch, voltmeter, ammeter and double pole, double-throw switch for connecting the primaries of high potential transformer in series or multiple; 8, oil insulated high potential transformer giving 8,000 or 16,000 volts; 9, choke coils mounted in transformer box to protect secondary coils from high frequency surges; 10, safety discharge gap to protect transformer in connection with choke coils; 11, two-plate glass condensers, one of about .021 micro-farads, and one of about .012 micro-farads, adjustable in single plates; 12, adjustable disk spark gap; 13, large high frequency coil; 14, small oscillator with adjustable primary turns; 15, wireless jigger or oscillation transformer inductively coupled to aerial, 17; 16, tuning coil for adjusting wave length.

Fig. 5 shows general view of apparatus and high frequency coil in operation.

The high potential transformer consists of a core type transformer, having a primary and secondary wound on each leg. The primary consists of 260 turns of No. 15 B. & S. double silk magnet wire, 130 turns being wound in two layers on a hard fibre spool on each leg. The secondary consists of 20,000 turns of No. 32 B. & S. double silk magnet wire, wound in 40 sections on micanite spools, 20 sections in each half, having 1-32-inch of micanite between sections and 5-32-inch of micanite between primary and secondary and 1/4-inch micanite between end of spools and iron. The transformer is placed in a wooden box containing boiled linseed oil,

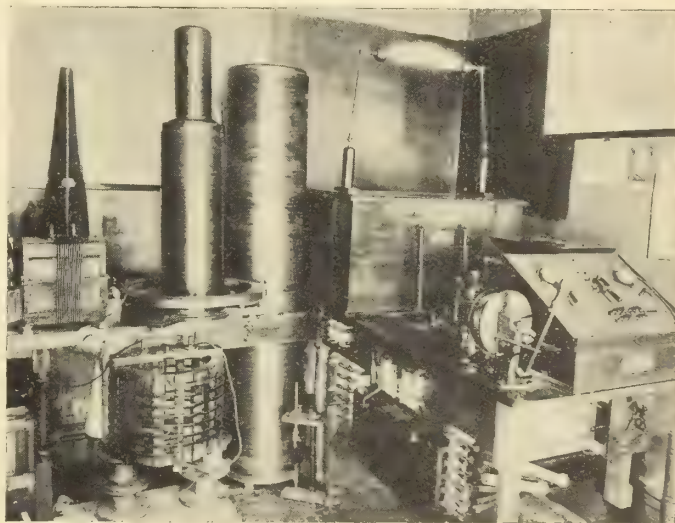


Fig. 5.

in which is also placed two choke coils, one in each lead of the secondary, consisting of two hard fibre spools, each wound with 1/2-pound No. 28 B. & S. D.C.C. magnet wire.

Considerable difficulty was at first experienced, due to high frequency surges getting into the secondary of the transformer and causing breakdowns of the insulation. This was finally eliminated by placing choke coils in the secondary leads of the transformer and shunting them with a discharge gap. The condensers consist of



one fixed condenser of about .021 micro-farad capacity, made up of 21 sheets of glass 16-inch x 24-inch x  $\frac{1}{8}$ -inch with 20 sheets of thin tin 14-inch x 22-inch, and one adjustable condenser of about .012 micro-farads capacity, made up of 13 sheets of glass 16-inch x 24-inch x  $\frac{1}{8}$ -inch, and 12 sheets of thin tin 14-inch x 22-inch, both of the above being placed in wooden boxes, and a compound of beeswax, paraffin wax, resin and a little engine oil to keep same from becoming brittle, poured into the boxes while hot. This construction has given excellent results and has never had a breakdown in over two and a half years' use. The spark gap consists of two zinc discs, one being stationary and the other adjustable by turning the three adjusting or levelling screws. A number of experiments were made with different kinds of spark gaps, but the one mentioned above was finally adopted as giving the best results without the use of a magnetic blow out, or air blast. The discharge across the spark gap is practically a short circuit across the secondary terminals of the transformer, and if this arc discharge is not suppressed or broken up, there will not be a true oscillatory discharge in the condenser circuit (or only a very weak one), for the reason that as the arc discharge holds, the secondary terminals of the transformer are reduced in potential. Until the arc is destroyed, therefore, the spark gap cannot build up a sufficient difference of potential to give a fresh charge to the condenser. However, with the arrangements used and with sufficient choke in the primary of the transformer, the discharges are found to follow each other in very

and capacity of the secondary system also influence the number of discharges obtainable during an alteration. The less the inductance and capacity of the conductors connected to any given oscillator, the greater the number of discharges obtainable per second, and likewise, if the inductance and capacity of an oscillator be reduced, the rate of sparking will be increased.

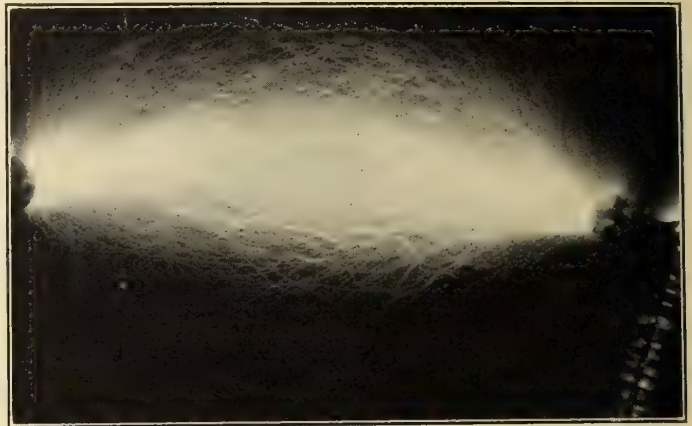


Fig. 7.

An interesting point stated by some authorities and which I believe has been proved by means of the oscillograph, is, that the instantaneous value of the current in the spark may in certain cases reach several hundred amperes, while the maximum current flowing in the secondary of the transformer does not exceed an ampere, this difference being caused by the difference in the duration of the phenomena.

The high frequency coil is constructed of two cardboard cylinders, one being 8-inch in diameter x 24-inch long, on which the secondary is wound, and which consists of a single layer of No. 32 B. & S. double silk magnet wire, wound the full length of the cylinder in a single layer, the other being 11-inch in diameter and 24-inch long, on which the primary is wound and which consists of a single layer of ten turns of insulated copper

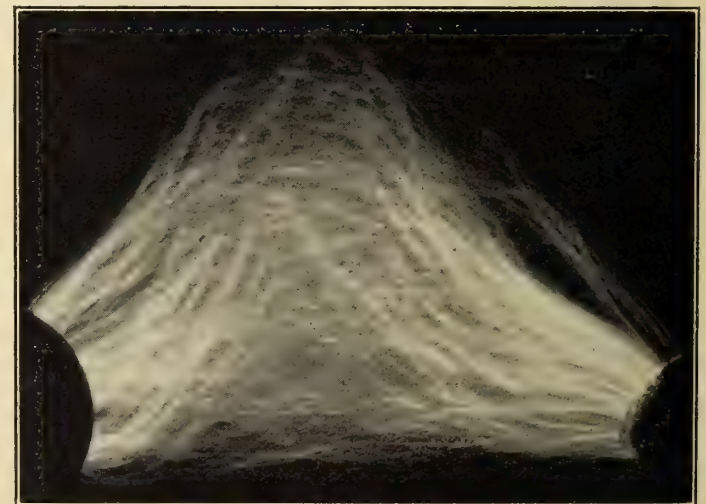


Fig. 8.

strip, one-inch wide, which is wound on the central portion of the cylinder.

The secondary is placed inside the primary cylinder and supported concentrically, leaving  $1\frac{1}{2}$  inches oil space between the two cylinders. The ends of the secondary winding are brought out, enclosed in hard rubber and

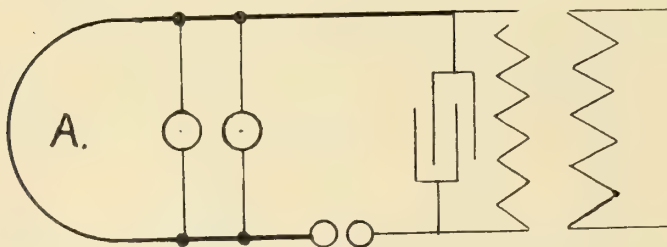


Fig. 6.

rapid succession, travelling all over the surface of the discs. Professor Q. Majorana, who was successful in obtaining a spark rate of 10,000 a second, says: "By placing a choke coil of considerable inductance in the supply circuit, a large number of secondary discharges may be obtained for every alternation of the primary current, particularly when the discharge voltage is kept relatively low by the use of a short gap. The moment the spark commences, the total primary voltage comes on the choking coil, the supply current suddenly falls and the energy is no longer forthcoming for the maintenance of the arc."

When the arc has been extinguished the voltage again divides itself between the choking coil and the primary of the transformer, and hence, as the primary voltage continues to increase, the induced secondary voltage may again rise sufficiently to cause a spark. The action then repeats itself. The self-inductance of the transformer diminishes, the primary current suddenly rises, the choking coil begins to act and checks the supply of energy so suddenly that the second arc also breaks. Spark after spark thus follows, and all the more rapidly as the primary voltage nears its maximum, but after this has been passed the intervals between them increase until a point has been reached when they leave off until after the commencement of the next alteration. A large number of discharges is therefore obtained at every alteration by the aid of the choking coil. The inductance



glass tubes. The coil is placed in an oil-tight box containing 12 gallons of linseed oil. The primary winding would have been better if composed of a large number of fine insulated wires braided together, as they offer less resistance to high frequency currents than a solid wire, although the copper strip answers the purpose very well. In the construction of high frequency transformers which are used for the production of high potentials in the secondary circuit, and which sometimes contain a large number of turns, there may exist great differences of potential between turns, necessitating high insulation, and it has been found that the only construction that will stand, is that in which the primary and secondary are wound in a single layer, and the coil immersed in a highly insulating oil, this being the only insulation that can be depended upon for the permanent insulation of high frequency currents, unless the apparatus is made on a scale excessively large for the length of discharge to be obtained.

The small oscillator consists of two cardboard cylinders placed one above the other and connected in series. The lower cylinder is 24-inch x 8-inch, having 325 turns No. 20 B. & S. bare copper wire; the upper cylinder is 11-inch x 5-inch, and wound with 152 turns of No. 20 B. & S. bare copper wire with a string between the turns, making 477 turns in all. This comprises the secondary. The primary consists of a number of turns of 1-inch flat copper strip, wound one over the other, with an insulating strip between the turns. This has an outside diameter of 15 inches, the number of turns being adjustable by a connection which is slipped in between the turns. The primary is connected in series with a spark gap and condenser. One end of the secondary is grounded, the other terminates in a rod with a small brass ball at the end. The above oscillator is in resonance with two turns in the primary and a capacity of about .007 micro-farads and takes 15 amperes in the primary of the high potential transformer, the primaries being connected in multiple and the secondary giving 16,000 volts. The primary of the oscillator, being placed at the lower end of the secondary, forces, as it were, the high frequency discharge to the free end of the secondary. It is very necessary that the two circuits be tuned in resonance, otherwise the results obtained are disappointingly small. No results are obtained unless the lower end of the secondary is grounded. At the free end of the secondary of the oscillator the potential is a maximum, the current increasing and the potential decreasing as we move toward the lower end, the current being a maximum at the grounded end.

#### The Large Oscillator

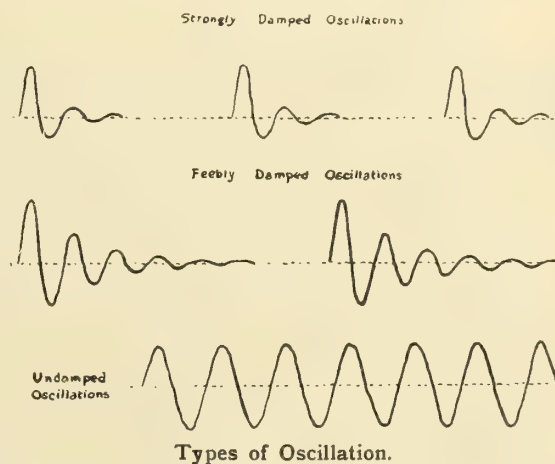
The large oscillator consists of a large cardboard cylinder 12-inch x 60-inch long, wound with 862 turns of No. 20 B. & S. bare copper wire. The primary consists of a number of turns of 2-inch copper strip and is constructed in the same manner as the small oscillator described. The primary has an outside diameter of 21 inches and is in resonance with about .012 micro-farads capacity and six turns in the primary, taking about 20 amperes in the primary of the high potential transformer, the primaries being connected in multiple and the secondary giving 16,000 volts.

These oscillators can be connected in series by being placed one on top of the other, but, owing to limited space, the writer has been unable to try the results obtainable with this arrangement. A large number of very interesting experiments can be made with the apparatus described. One, which is particularly interesting to those who are only familiar with low frequency

currents, is the impedance which high frequency currents present to solid conductors. If we connect the apparatus as in fig. 6, A being a solid copper rod  $\frac{1}{2}$ -inch or so in diameter, we are enabled to illuminate incandescent lamps of 50 to 100 volts across the loop formed by the copper rod, although this is practically a short circuit to low frequency currents. One of the peculiarities of high frequency currents is their ability to pass to objects from one terminal of the apparatus even if the object be highly insulated, and there are a number of experiments which can be performed just as well with only one connection to the high frequency coil. Perhaps the most interesting experiments are the beautiful discharges that are obtainable with a high frequency coil, especially if conducted in a dark room. Fig. 7 shows a 22-inch discharge. Fig. 8 shows a 6-inch discharge

All the above photographs were taken with the primaries in series taking 25 amperes at 107 volts, the secondary giving 8,000 volts, and having a capacity of about .033 micro-farads.

A number of different kinds of discharges are obtainable by the adjustment of the choke coil, spark gap, and the amount of capacity in circuit, from a flaming discharge to the thread-like discharge of a static machine. In fact, it is possible to imitate the discharge of a



static machine so that the difference is not discernible. Beautiful brush discharges are obtainable by cutting down the capacity so that no discharge takes place, separating the discharge rods, and placing them in a perpendicular position. A solid sheet of blue flame fills the space between the rods and a strong brush discharge takes place from the rods and the 2-inch balls at the end of the rods. Vacuum and Geisler tubes are brilliantly lighted some distance from the coil, due to the strong electro-static field set up. Very good results are also obtained from the high frequency coil with X-ray tubes, which is capable of exciting some of the largest tubes on the market. The experiments with the small oscillator are particularly interesting in that they allow quite a large current to be passed through the body with very little sensation being felt. It has been stated by a number of authorities at different times that 1-10th part of an ampere at low frequency passed through a vital part of the body, would cause death, yet by the use of high frequency currents we are enabled to pass one-half an ampere or more with hardly any sensation being felt. The small oscillator gives a brush discharge at the free end six or seven inches long, and by holding in the hand a metal rod, thick white discharges eight or nine inches long can be drawn from the end of the secondary. It is

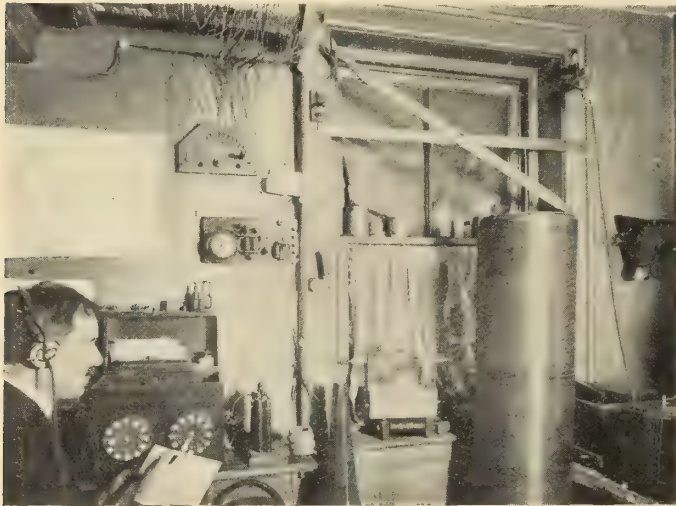


necessary to hold a piece of metal in the hand, otherwise a stinging sensation is experienced.

If a 16 c.p. lamp taking one-half an ampere be held between two people, one of them touching the oscillator with a metal rod, and if the rod be moved toward the grounded end, the current is increased and a point is reached near the end where the lamp burns up to candle power. If a piece of fine wire be substituted for the incandescent lamp as described above, it can be melted by the current flowing between the two people. In the same manner a nernst glower fastened to the end of a metal rod, can be brought up to incandescence. This experiment takes a little time, as the discharge will jump across the refractory material, and it is necessary for it to become warmed up and become more or less conducting before it will come up to candle power. This sometimes takes three or four minutes.

An X-ray tube held in the hand close to the end of the oscillator, is brilliantly excited by the current passing through the body, and excellent results are obtained with a fluoroscope used by another person.

An ordinary oil lamp can be lighted by touching the oscillator as described, and with a finger of the other hand touching the wick of the lamp. It is also possible to light a cigarette held in the mouth and touched with a rod as described. This experiment was tried by the writer, and was decidedly uncomfortable, as the dis-



Mr. Vaughan Making Observations.

charge jumps to the tongue and mouth. Geisler and vacuum tubes held in the hand four or five feet away are brilliantly lighted. Another experiment which is very perplexing to those not familiar with high frequency phenomena is the insertion of a 110 volt, 16 c.p. lamp in series with the grounded end of the secondary, which burns up to candle power, being practically on an open circuit.

Either the above or a hot wire ammeter is used by the writer to adjust the circuits to resonance. There are a number of other interesting experiments, but they are too numerous to mention. The large oscillator described may be used in a similar manner, but owing to the larger capacity necessary to bring it into resonance, which lowers the frequency, it was found that, while it was possible, the current passing through the body produced more or less muscular contraction and was very unpleasant.

The apparatus has also been used very successfully by the writer for wireless telegraphy, in which case it is connected with the oscillation transformer or jigger, as

shown at the extreme left of the diagram of connections, and also shown in the photograph, fig. 5, and is practically the same as used by most commercial wireless stations. The primary of the oscillation transformer is connected in series with the condenser and spark gap, and consists of two turns of six No. 14 B. & S. stranded rubber covered wires in multiple, wound on a square wooden frame. The secondary consists of 82 feet of No. 18 rubber covered wire, wound in a single layer on a square frame inside the primary, one end going to the aerial, the other going through a tuning coil to ground, shown in the photograph in fig. 5. It was designed for about 400 meter wave length, with 100 feet aerial, and is in resonance with a capacity of about .007 microfarads, the current used on the low tension side of the high potential transformer being 18 to 20 amperes, the primaries being in multiple, and the secondary giving 16,000 volts. The receiving apparatus consists of adjustable condenser, detector, head phones of 1,500 ohms resistance, potentiometer, and batteries. Several detectors are used, including electrolytic, using platinum wire .0001 of an inch in diameter, silicon, carborundum, carbon knife edges with steel needles, and tantalum wire dipping in mercury.

The aerial wire is brought through the centre of the window, and attaches to a switch for sending or receiving, clearly shown in the photograph. While the receiving apparatus is rather crude, stations 200 miles away have been easily read, also some of the larger stations, including New York and Glace Bay.

The writer has under construction at present new receiving apparatus, through experience gained with the above. Several experiments were tried with wireless telephony, using the sending apparatus with a microphone in the grounded side of the aerial, and while it was possible to partly distinguish some words two miles away, it was found impracticable, owing to the low spark frequency.

It has been found that it is necessary to use undamped oscillations having a frequency of not less than 20,000 a second. This is accomplished either by the use of a high frequency alternator, such as is used by Prof. Fessenden, or by shunting a direct current arc with an inductance and capacity in series, and in some cases enclosing the arc in an atmosphere of hydrogen or alcohol flame.

## Rapid Progress in Mines Power Company's Installation

The Mines Power Company, Limited (Smith, Kerry & Chace, consulting engineers), contract for switching equipment, lightning arrestors, cables and wiring for the Matabitchouan river generating station and for the Cobalt and Kerr lake sub-stations, has been awarded to the Canadian Westinghouse Company. The apparatus includes 44,000 volt automatic oil circuit-breakers and electrolytic lightning arresters.

The first generator and water wheel were ready for shipment from the Allis-Chalmers-Bullock works on September 7, the exact date promised when on June 7th last the order was given for building four units of this type. Each unit consists of one 2,750 h.p. water wheel, a single runner horizontal shaft spiral case turbine, designed for 310-foot head and operating at 600 r.p.m., direct connected to a 1,500-k.w., 60-cycle, 3-phase, 2,400-volt generator.

A new condensed catalogue, including a complete line of their meters, has recently been issued by the Hoyt Electrical Instrument Works of Penacook, N.H.



## Tungsten Lamp Experiences

At the fifth annual convention of the Michigan Electric Association, held at Grand Rapids, Mich., an important discussion took place upon the general subject of "Various Experiences with Tungsten Lamps." The discussion upon the subject was opened by Mr. E. F. Phillips, of Detroit, Mich., who described an installation in one of the suburbs of Detroit, lighted by Tungsten series lamps. This locality is densely shaded, and there are 42 ornamental iron poles, irregularly spaced, each supporting two 60-candlepower, 75-watt lamps. Service was begun in November last year, the alternating-current supply being  $5\frac{1}{2}$  amperes. At first renewals were very numerous, but the current was dropped to five amperes with much better results, and now the cost of renewals is entirely satisfactory. The people are greatly pleased with the service. There was great breakage of lamps at first, but now this loss is small. Mr. Phillips gave these figures for seven months' operation since January 1, 1908:

Average monthly renewals .....	15.7
Average hours life .....	1,049
Average kilowatt-hours consumption .....	1,848
Average cost of lamp renewals per kilowatt-hour .....	0.83 cent.

Some interesting details in relation to the series Tungsten lamp illumination on Canal Street in Grand Rapids were given by Mr. F. E. Masterson, Grand Rapids. This installation consists of 15 spans across the street, with 18 60-candlepower, 75-watt lamps in series on each span. The spans are 100 feet apart. The initial expense of the installation for material and labor was practically \$50 a span, or \$750 in all, divided among so many merchants that the individual initial expense was small. The installation is permanent. From all points of view the installation seems to be very successful. It is a forcible advertisement for the merchants, and as the expense of operation is divided among a large number, each individual share is small, some members of the association paying not more than \$1 a month. The cost to the company of lamp renewals is one-half cent per kilowatt-hour. The breakage is less than six per cent. The height of lamps from the street is from 25 to 30 feet. Mr. Masterson said that as the life of Tungsten lamps is still an uncertain quantity, the company would not care to take additional business of similar character at less than \$7 per lamp per year.

### Street Lighting by Tungsten

Street lighting by Tungsten lamps in Hart, Mich., was briefly described by H. A. Chase. There are 62 lamps installed on poles spaced 150 to 200 feet apart, with lamps 12 feet from the ground. The first three burn-outs came after 92, 182 and 184 hours of light, respectively. The lamps have shown no blackening, and Mr. Chase is well pleased so far with his experience.

A. C. Marshall, of Port Huron, the secretary of the association, reported the experience of that city. There the lamp comes into play in going after gas-light users, the idea being to get enough new business to offset any loss of income from old customers due to the use of the high-efficiency lamp. Tungsten fixtures are sold at actual cost, but lamp renewals are made at list prices. Sixty-watt and 100-watt sizes are used.

Alex Dow, of Detroit, said that the small householder was afraid of the cost of electric lights. On the other hand, it cost the central-station company in Detroit from \$40 to \$50 to put an ordinary small house on the company's circuits. This was due to the cost of meter, transformer, wiring, etc. Anything that tended to reduce this cost would be exceedingly welcome. A regulator, for instance, would only cost half as much as a meter. Perhaps the cost of service wiring would be less also. But in large cities, where underground construction was required, it was to be feared that the business of the medium-sized house would not be sufficient to warrant the expense of extending underground mains to secure it. Perhaps something could be done, where overhead wires were permitted, with the workman's cottage idea.

Central-station companies themselves must control the Tungsten-lamp situation. It was doubtful if the lamp would remain as it was to-day. Probably it would take a different final form, having greater strength, longer life and lower cost. In any event, this final form must be worked out in practice, as was actually being done at the present time. The Tungsten lamp had come to stay. In series street lighting, the lamp had arrived "with both feet." Where a certain amount of light was to be furnished, as in street lighting, the Tungsten series lamp was extremely serviceable. And after all the adjustments of the future were made, the lamp would no doubt "arrive" for all forms of commercial illumination.

Fred T. Benson, manager of the Tungsten-lamp department of the Chicago office of the General Electric Company, said that perhaps the new 250-watt Tungsten would in many cases take the place of the arc lamp for street lighting. Experiments were under way in the direction of strengthening the filament, perhaps by alloying the Tungsten with other metals.

## Tungsten Ores in Canada

"A Report on the Tungsten Ores of Canada," by Prof. T. L. Walker, of Toronto University, has been issued by the Mines Branch of the Department of Mines of Canada at Ottawa. The report covers 56 pages and includes 15 illustrations.

Amongst the rare metals which have recently become of commercial value, tungsten is an important example. One of its most recent applications is as a filament in incandescent lamps, in which it gives a much more brilliant light with greater efficiency than carbon. Its most important use, however, is in the manufacture of tungsten steel, to which it imparts great elasticity and tensile strength. The metal has, therefore, become particularly valuable to the manufacturers of special steels. The known occurrences of tungsten ores throughout the world are comparatively few, which fact lends additional interest to some discoveries of scheelite (an ore of tungsten) which have been made within the past year or two in Nova Scotia. These, together with other occurrences of tungsten ores in Canada, have been made the subject of the present report, which is designed to present to those interested all the available information on these ores.

The several occurrences of tungsten ore in Canada are described in detail, and a general statement is given on the geological occurrence of the ores, chemical tests, concentration, the uses of the metal, producing mines in other countries, statistics of the world's production, etc., while a very useful bibliography of the literature on Canadian and United States occurrences is added.



## Electric vs. Flame Heat

Flame, as a direct source of heat, is at best a faulty servant. In consuming oxygen it produces carbon dioxide and other harmful gases; it wastefully warms huge volumes of inert nitrogen, with the result that temperatures are much reduced. If the fuel contains sulphur or phosphorus these much impair the quality of molten iron or seething steel. In dwellings, in mines, on shipboard, the necessary consumption of air is a dire evil; more serious still is the outpouring of deadly gases. Flame labors under other disadvantages. It is on the outside of a crucible or retort that it beats; the shell to be penetrated, if the steel plate of a big boiler, may be an inch thick; much thicker, and non-conducting as well, is the brick wall of a bake oven. Flame produces much heat of little worth because of low temperature. The whole Atlantic Ocean might be luke warm and still leave a potato unboiled. It is the margin by which a temperature overtops the degree needed for boiling, melting or welding that decides its value. Yet more: flame at most has a play of only a few inches. Even when it raises steam, the best of all heat carriers, that steam may be borne no further than a mile without excessive loss. All these faults and wastes disappear when, instead of flame, we employ electric heat, notwithstanding the cost of its roundabout production by a furnace, a heat engine and a dynamo. In many cases the engineer can happily dispense with fuel altogether, and draw upon a waterfall, as notably at Niagara. Electricity, in whatever mode produced, may be easily and fully insulated, taken if we please, 100 miles, and there, through non-conducting mica or asbestos, enter the very heart of a kettle, to exert itself as heat, without an iota of subtraction. It has no partner, gaseous or other, to work injury or levy a tax. Electricity, too, by a transformer, may be readily lifted from low to high voltage, or pressure, immensely widening its effective play in soldering, welding, smelting. At any temperature desired, there, with perfect constancy, electric heat may be maintained, with no need that a branding or smoothing iron return periodically to a fire, with risk of scorching.—From "Electricity's Latest Triumphs," by George Iles, in the American Review of Reviews.

### Storage Batteries for Barges

Of the various plans proposed and tried for moving barges along canals by means of electric power, says the "Electrical Review," the storage battery has of late received scant consideration. This is probably due to the failure of the battery to compete with the trolley system in electric railway work, and hence we have had descriptions of various plans of hauling boats by tractors running on a towpath, some of these being more or less elaborate, depending upon the amount of traffic to be handled. The tractor system is reported to be giving good service in France, but it is rather inflexible, and somewhat expensive to install. For the shorthaul system, where many barges are to be handled, it is not particularly attractive, and probably this reason has something to do with the determination to try a storage-battery equipment on the canal connecting Berlin with Brandenburg, where there are important brick fields. At all events the storage battery system has been tried, and has given such good success that the original fleet of seven experimental barges has now been increased by 112 new vessels, all propelled in the same way.

The equipment, in brief, consists of a motor driving the barge, through a propellor, at about three miles an hour. Power is drawn from a storage battery equipment weighing some ten tons, the charge of which is sufficient to carry the vessel from one end of the route to the other. At each end the batteries are charged without being removed, while the barge is loading or unloading, as the case may be. Each trip requires about two days; the round trip, including loading and unloading, about a week, which is a reduction of seventy-five per cent from the time required to do the work by the old method of animal traction. Not all of this gain has been due to the increased speed of the boat, as a considerable part of it has been secured by the addition of suitable unloading and loading equipment at the quays. The cost of a single charge of the batteries, which is sufficient to propel the barge through fifty miles, is given as twenty-five marks or about \$6.25. No comparative costs for other means of propulsion are given, but the new system is evidently eminently satisfactory.

The system as here used seems excellently suited for the short runs which are made. The cost of the service can not be great, as the barge is controlled by two men, a helmsman and an engineer.

### Traction System for Long Hauls

For long-haul traffic the traction system seems to present some advantages over the accumulator. And when a trip requires a week's travelling, say, it would probably be out of the question to equip the boat with a sufficiently large storage battery to carry it from one end to the other. It would be necessary in this case either to stop every day or so while the batteries were being charged or to remove the exhausted set and replace it with a fresh one. The former plan would not add very much to the time of the trip, for according to the descriptions of the Berlin-Brandenburg system the batteries are charged for a two-day's run, during the six hours required to load or unload the boats. However, the plan of replacing exhausted cells by a fresh lot at fixed stations has some attractions, for in this way there would never be any necessity to tie up a barge because of a battery trouble, and the cells could then be charged at a lower rate, which might be more beneficial. These charging stations could be scattered along the canal and in many states obtain cheap power from hydraulic stations already in existence. By this plan it would be practicable to reduce the size of the batteries, allowing them to be replaced once a day. With suitable equipment for handling the batteries the exchange could be made in a very short time. Although the storage battery has not proved itself suitable for general traction purposes, it is making good headway in city automobile work, and the conditions on the canal boat should be even more favorable to it, as it would there be less subject to vibration and could be proportionally lighter in construction, and would have a longer life.

### Largest in the World

The contract for what are believed to be the largest generators in the world has recently been awarded to the General Electric Manufacturing Company, of Sweden. The five generators are to be supplied for the Rjukan saltpeter plants in Norway, and are each of 23,000 electrical horse power, 11,000 volt, 50 cycles, 250 r.p.m., of the horizontal water wheel type, totally enclosed and ventilated by the revolving field, which acts as a fan. Kilmer, Pullen & Burnham, Toronto, are Canadian representatives for this firm.



## An International Standard Cell

The specifications relating to the Weston normal cell as determined by the International Conference on Electrical Units and Standards, are stated below. This cell at a temperature of 20 degrees C, gives an e.m.f. of 1.0184 volts.

The Weston normal cell is a voltaic cell which has a saturated aqueous solution of cadmium sulphate ( $3 \text{ Cd SO}_4 \cdot 8\text{H}_2\text{O}$ ) as its electrolyte.

The electrolyte must be neutral to Congo Red.

The positive electrode of the cell is mercury.

The negative electrode of the cell is cadmium amalgam consisting of 12.5 parts by weight of cadmium in 100 parts of amalgam.

The depolarizer, which is placed in contact with the positive electrode, is a paste made by mixing mercurous sulphate with powdered crystals of cadmium sulphate and a saturated aqueous solution of cadmium sulphate.

For setting up the cell, the H form is the most suitable. The leads passing through the glass to the electrodes must be of platinum wire, which must not be allowed to come into contact with the electrolyte. The amalgam is placed in one limb, the mercury in the other.

The depolarizer is placed above the mercury and a layer of cadmium sulphate crystals is introduced into each limb. The entire cell is filled with a saturated solution of cadmium sulphate and then hermetically sealed.

The following formula is recommended for the e.m.f. of the cell in terms of the temperature between the limits  $0^\circ\text{C}$  and  $40^\circ\text{C}$ .

$$E_t = E_{20} - 0.0000406 (t - 20^\circ) - 0.00000095 (t - 20^\circ)^2 + 0.00000001 (t - 20^\circ)^3$$

## Some Aspects of the Single-Phase Motor

The difficulty met with in the operation of single phase motors up to the present time lies in the fact that they are not equal in all respects for constant speed service with polyphase induction and direct current motors.

When such a standard may be reached more ideal conditions will exist for transmission purposes from central stations, because, as in polyphase transmission, most of the service at the customer's end is connected to two terminals only, it therefore becomes a single phase circuit; it follows naturally that it would be more simple to furnish power to single phase motors if only the services of the latter were equally satisfactory and efficient to those of the polyphase motor of the present.

It cannot be said as yet that a single phase motor has been designed of the simplicity of construction of the polyphase motor, or having the same operating value of the latter or of the direct current motor, but, owing to the high development of these two types, this problem is for the future to solve.

In taking the induction type of single phase motor and comparing it with its polyphase competitor, it is found to be less efficient in operation and in addition requires some form of starting device. The commutator type also owing to commutation trouble on starting is not as efficient as its direct current prototype.

Several attempts have been made to neutralize the lack of starting torque, which is a great drawback to the induction type of the single phase motor, a simple method being the introduction of a single turn of copper placed around the half of each field pole, which has been termed a "shading coil," the principle of which is that as the magnetism increases in the pole, lines of force tend to pass through this coil creating a current whose magneto-motive force is in a direction tending

to reduce these lines. Thus, while the field flux increases at a greater rate in the portion not influenced by this "shading coil," it is retarded in the shaded part, increasing and decreasing in a lesser degree as the primary magnetism increases and decreases, so that an irregular motion from the unshaded to the shaded part of the pole is set up.

A short circuited rotor being placed in this field is drawn into rotation and will operate at a speed approximate to synchronism with consideration torque; this device has been largely used with motors of low rating. In the majority of cases the disadvantages of lack of starting torque in these induction types has been more or less met by the use of some device as above.

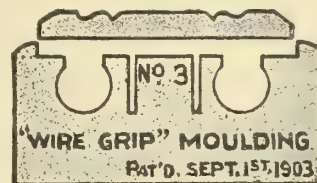
Another method is to convert the machine into a "repulsion" motor—so-called—at starting, the circuits being altered for induction motor operation after coming up to speed; the idea being to have the rotor provided with a commutator with brushes short circuited upon themselves, the current thus produced acting as a short circuited secondary to the field winding, giving to the rotor a high starting torque. As the machine comes up to speed a clutch or some mechanical device removes the brushes—of which there are a pair to each pole—from the commutator, and also short circuits the segments of the commutator.

In the commutator type it has been found that the disadvantages met with were less as the rating was smaller, earlier designs were thus of a low rating and mostly used as fan motors, were series wound and differed little from direct current motors except that the magnetic circuit was laminated. They were found to operate best at a low frequency; later designs have, however, been used on as high as a 60 cycle circuit.

Although the single phase motor in connection with central station work has not as yet reached a high stage of development, they are to be obtained equally as efficient in service as other types of a few years ago which are still in use and satisfactory, and their copper cost is no higher than the three phase system, according to some authorities, and as at present operated costs less as regards line insulators.

## "Wire Grip" Moulding

The accompanying cut illustrates what is known as the "Wire Grip" moulding, put on the market some time ago by the Mitchell Moulding Company, of Chicago. Since its first introduction practical electricians have not been slow to recognize and appreciate the advantages claimed for it. In the cut it can be observed that the opening for the wire is narrower at the top than



at the bottom. A small opening opposite the groove allows leeway for the wire to be placed in its position, where it is automatically held, thus dispensing with the use of wire nails or staples. Another advantage claimed for this moulding is the smooth, straight finish which is guaranteed in all deliveries. The Canadian sales agent for "Wire Grip" moulding is Mr. Irving Smith, 44 St. Antoine street, Montreal, who states that in the Canadian market this form of moulding has been meeting with marked success.



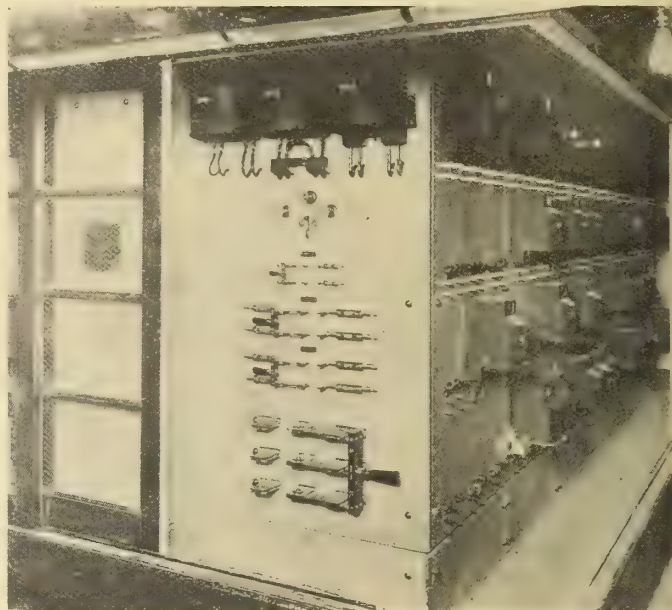
## Canada Permanent Rewires Throughout in Rigid Iron Conduit

About a year ago the Canadian Fire Underwriters called the attention of the management of the Canada Permanent Mortgage Corporation to some improvements which the Underwriters desired in connection with the electric wiring in the Canada Permanent building. The building was originally wired on the knob and tube system, which, at the time it was installed, was doubtless executed in the very best manner possible, but had from time to time been subjected to danger owing to the running in of various plumbing and steam pipes and the alteration of wiring as a result of subdividing offices for incoming tenants.

The matter was reported on by the Hudson Electrical Company, who advised the entire re-wiring of the building in rigid conduit, all conduits to be assembled at some one point in the basement where all changes in connections could be made and where all meters could be located. The report was approved by Mr. H. F. Strickland, chief electrical inspector of the Canadian Fire Underwriters' Association, who, at the request of the company, prepared specifications for the work. Owing to the enormous amount of cutting and disturbances which would otherwise be necessary it was decided to re-wire on the surface. The contract was awarded to the Hudson Electrical Company, and we understand the total cost amounts to somewhere in the neighborhood of \$10,000.

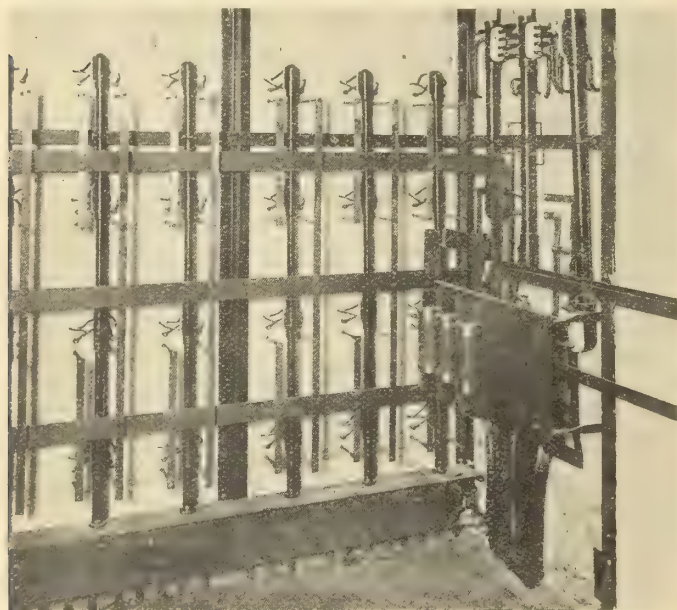
The work has now been successfully completed and presents some features which are well worth a trip on the part of electricians interested in this class of work. The metering switchboard in the basement is considered one of the finest arrangements to be found in any office building in Canada. By an entirely novel and simple method any two or more offices anywhere in the build-

screws. From every separate office in the building a conduit tube is run down to the basement, where the switchboard is located. These conduits rise from the floor of the basement and terminate in the iron trough, being spaced so that they will face opposite one or other of the meters for which they are intended. Should any change be required it is only necessary to divert the wires in the iron trough to a different conduit tube which rises



All Meters Installed at One Point in Basement.

from the trough to the meter on the board. On the face of the board nothing is visible but the meters and fuses. The board is made of blue Vermont marble mounted on a suitable iron frame, and besides the metering panels it contains a main line switch panel by which either the overhead or underground current can be utilized. The board is approximately 30 feet long by 7 feet high, and was manufactured especially for the Hudson Electrical Company by the well known Crouse Hinds Company, of Syracuse. The whole board is enclosed in a well made and neatly designed iron and wire glass fireproof enclosure provided with sliding doors, by which arrangement all the meters can be seen without entering the enclosure, the front of the board being beautifully illuminated on the inside. The completed installation was finally tested by the Canadian Fire Underwriters' inspectors and showed an insulation resistance of 1.5 megohms between all conductors and the earth. The reduction in fire insurance premiums payable by this corporation is, in consequence, understood to be considerable.



Back View of Switch and Meter Boards. Note Iron Trough at Bottom where all Connections are made.

ing can be connected together or disconnected without any change in the switchboard or resort to any plugging or cross connections. This feature consists of a cast iron duct or trough about 4 inches square which runs horizontally along the bottom of the switchboard, extending the entire length of the board and resting about 6 inches above the floor line. The trough is provided with a cover put on in sections and secured in place with machine

Under favorable conditions an average person does not experience any sensation from an electrical current until the tension reaches about 35 volts.

Electric propulsion for Atlantic liners is under experiment by British engineers, who figure that electric drive will increase the speed of rotation of the screws.

The municipal council of St. Lambert has granted the Montreal & Southern Counties Railway Company a 21-year franchise to operate in that town, with a 12-year exemption from taxes of all kinds. Construction must be commenced at once and the system be in operation by the 1st of June next. Cars to be operated at not more than 60-minute intervals between the hours of 6.15 a.m. and midnight. The by-law will be shortly submitted to the ratepayers for approval.



## The Work of Electric Roads

With the completion in the course of a year of their new Chilliwack extension and other contemplated lines, the British Columbia Electric Railway Company will have a network of electric road comprising 150 miles. The progress of this company since its inception has been very marked. They have not waited for the new country to develop but have rather developed many districts by the enterprise and confidence they have shown, and already this company has invested \$12,000,000 in railway and power plant construction.

Twelve years ago the present company took over and consolidated the separate systems then in existence. Since then they have gradually been able to give the public the benefit of a more efficient service and lower lighting and power rates. At the same time the company has had to face a constantly growing expenditure in order to extend their lines and keep their plants and rolling stock in good repair.

Last year the company carried 21,000,000 passengers, and it is estimated that this year's total will reach 25,000,000 before the end of December.

The company are paying special attention to their



One of B. C. Electric Company's New Locomotives.

suburban freight service, and when their expensive Chilliwack line is completed the outlying farmer will be able to market his produce in Vancouver and Westminster under the favorable conditions of reasonable freight rates with utmost despatch.

The company have found it necessary to constantly increase their power supply. In 1904 the Lake Buntzen power plant was installed with two units of 3,000 horse-power each. Since then two 3,000 units and one 10,500 unit have been installed, and it is now proposed to add an additional 10,500 horse-power to the power department.

The tunnel between Lakes Buntzen and Coquitlam is being enlarged to twice the present capacity, while the dam at Lake Coquitlam is being raised to sixty feet. This will give a much larger storage capacity and provide a large percentage of reserve power for the future.

The company employ 1,200 men on their staff and have in vogue a system of profit sharing with their employees. Last year these profits aggregated \$40,501, an average of \$66.78 per man to all those who had been in the company's service for one year or more.

The accompanying figure represents one of the electric locomotives recently purchased in England from

Messrs. Dick, Kerr & Company, for use on the British Columbia Railway. These locomotives have a rated maximum tractive effort of 16,000 pounds, and a maximum instantaneous effort of 25,000 pounds.

The following data with reference to the locomotives is of interest:

Diameter of driving wheels .....	42 in.
Total wheel base .....	24 ft. 6 in.
Wheel base of each truck .....	8 ft. 0 in.
Length over all .....	35 ft. 7 in.
Length of main cab .....	16 ft. 5 in.
Height of cab above rail level .....	14 ft. 1½ in.
Width of cab .....	9 ft. 8 in.
Total weight of locomotive .....	50 tons

## Standard Specifications

The American Society for Testing Materials, which met recently in Atlantic City, recommended the adoption of the following standard specifications for hard drawn copper wire. The vote, which was taken by mail and occupied several weeks, is now announced as approving the recommendations.

1. The material shall be copper of such quality and purity that, when drawn hard, it shall have the properties and characteristics herein required.

2. These specifications cover hard-drawn round wire, grooved trolley wire and hard-drawn cable or strand, as hereinafter described.

3. The wire, in all shapes, must be free from all surface imperfections not consistent with the best commercial practice.

4. (a) Package sizes for round wire and for cable shall be agreed upon in the placing of individual orders; standard packages of grooved trolley wire shall be shipments upon reels holding about 2,500 lbs. each.

(b) The wire shall be protected against damage in ordinary handling and shipping.

5. For the purpose of calculating weights, cross-sections, etc., the specific gravity of copper shall be taken at 8.90.

6. All testing and inspection shall be made at the place of manufacture. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities to enable him to satisfy himself that the material conforms to the requirements of these specifications.

### Hard-Drawn Round Wire

7. (a) Size shall be expressed as the diameter of the wire in decimal fractions of an inch, using not more than three places of decimals, i.e., in mils.

(b) Wire is expected to be accurate in diameter; permissible variations from nominal diameter shall be:

For wire 0.100 in. in diameter and larger, one per cent. over or under.

For wire less than 0.100 in. in diameter, one mil over or under.

(c) Each coil is to be gaged at three places, one near each end, and one approximately at the middle; the coil may be rejected if, two points being within the accepted limits, the third point is off gage more than 2 per cent. in the case of wire 0.064 in. in diameter and larger, or more than 3 per cent. in the case of wire less than 0.064 in. diameter.

8. The wire shall be so drawn that its tensile strength and elongation shall be at least equal to the values stated in the following table. Tensile tests shall be made upon fair samples, and the elongation shall be determined as the permanent increase in length, due to the breaking of the wire in tension, measured between

bench marks placed upon the wire originally 10 ins. apart. The fracture shall be between the bench marks, and not closer than one inch to either mark. If, upon testing a sample from any coil of wire, the results are found to be below the values stated in the table, tests upon two additional samples shall be made, and the average of the three tests shall determine acceptance or rejection of the coil.

Diameter, inches.	Area, circular mils.	Tensile strength lbs. per sq. in.	Elongation in 10 ins. per cent.
0.460	211,600	49,000	2.7
0.410	168,100	51,000	2.6
0.365	133,200	53,000	2.4
0.325	105,600	54,500	2.3
0.289	83,520	56,000	2.1
0.258	66,560	57,500	2.0
0.229	52,440	58,500	1.9
0.204	41,620	59,500	1.8
0.182	33,120	60,500	1.7
0.162	26,240	61,500	1.6
0.144	20,740	62,500	1.5
0.128	16,380	63,400	1.4
0.114	12,996	64,200	1.3
0.102	10,404	64,800	1.2
0.091	8,281	65,400	1.1
0.081	6,561	65,700	1.0
0.072	5,184	66,000	0.9
0.064	4,096	66,200	0.9
0.057	3,249	66,400	0.8
0.051	2,601	66,600	0.8
0.045	2,025	66,800	0.7
0.040	1,600	67,000	0.7

For wire whose nominal diameter is between listed sizes, the requirements shall be those of the next larger size included in the table.

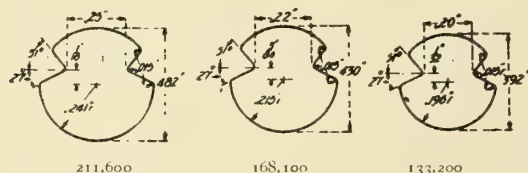
9. Electric conductivity shall be determined upon fair samples by resistance measurements at a temperature of 20 degrees C. (68 degrees F.). The wire shall not exceed the following limits:

For diameters 0.460 in. to 0.325 in., 900.77 lbs. per mile-ohm at 20 degrees C.

For diameters 0.324 in. to 0.040 in., 910.15 lbs., per mile-ohm at 20 degrees C.

#### Grooved Trolley Wire

10. Standard sections shall be those known as the "American Standard" grooved trolley wire sections, the shape and dimensions of which are as follows:



Proposed Standard Sections for Grooved Trolley Wire.

11. (a) Size shall be expressed as the area of cross-section in circular mils, the standard sizes being as follows:

211,600 c. m., weighing 3386 lbs. per mile.

168,100 c. m., weighing 2690 lbs. per mile.

133,200 c. m., weighing 2132 lbs. per mile.

(b) Grooved trolley wire may vary 4 per cent. over or under in weight per unit length from standard, as determined from the nominal cross-section.

12. The physical tests shall be made in the same manner as those upon round wire. The tensile strength of grooved wire shall be at least 95 per cent. of that required for round wire of the same sectional area; the elongation shall be the same as that required for round wire of the same sectional area.

13. The requirements for electric conductivity shall be the same as those for round wire of the same sectional area.

#### Hard-Drawn Copper Wire Cable or Strand

14. For the purposes of these specifications, standard cable shall be that made up of hard-drawn wire laid concentrically about a hard-drawn wire centre. Cable laid up about a hemp centre or about a soft wire core is to be subject to special specifications to be agreed upon in individual cases.

15. The wire entering into the construction of stranded cable shall, before stranding, meet all the requirements of round wire, hereinbefore stated.

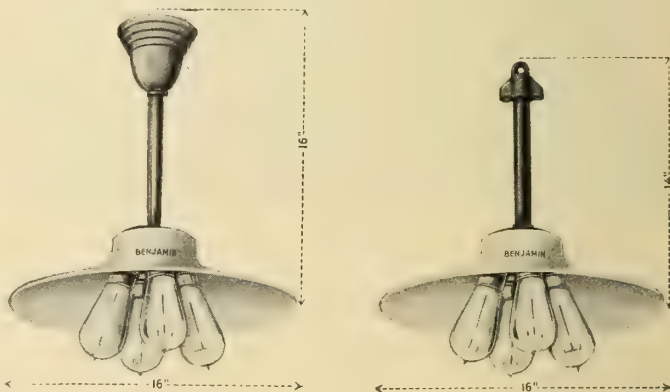
16. The tensile strength of standard cable shall be at least 90 per cent. of the total strength required of the wires forming the cable.

17. Brazes, made in accordance with the best commercial practice, will be permitted in wire entering into cable; but no two brazes in wire in the cable may be closer together than 50 feet.

18. The pitch of standard cable shall be not less than 12, nor more than 16, diameters of the cable. The cable shall be laid left-handed or right-handed, as shall be agreed upon in the placing of individual orders.

#### Wireless Tungsten Fixtures

The accompanying cuts illustrate two forms of wireless fixtures designed by the Benjamin Electric Manufacturing Company. These fixtures are built up around the type 3-T tungsten cluster. They have a 16-inch white enamelled steel reflector, deeply hooded to receive the cluster in such a manner that the lamps are in proper relation to the reflecting surface. The outlets are at an



angle of 16 degrees with the vertical. This slight angle not only does not endanger the filament of the lamps but adds materially to the lighting efficiency of the fixtures, inasmuch as one-half of the light of each lamp is directed downward and the other half at the same angle upward, to be re-directed by the reflector. Thus very little of the light of one lamp passes through the other lamps. The cluster body is attached to the reflector by means of a flange. A watertight joint is secured by the use of two rubber gaskets. These flanges are furnished for  $\frac{3}{8}$ -inch or  $\frac{1}{2}$ -inch pipe; the former for indoor, the latter for outdoor work. Two to four light fixtures take 100 watt lamps; five light fixtures take 40 or 60 watt lamps. They are furnished either multiple or series.

Electric snow melters were used last winter to clear the streets of Berlin.

On distributing systems lightning arresters should be spaced approximately 2,000 feet apart, and closer together at specially exposed points.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Question No. 1—Kindly state a rule for obtaining the horse-power of a motor on both two and three-phase circuits.

Answer—In the three-phase machine, read the current in each wire. Take the average of these three readings and multiply it by 1.73. Multiply the product by volts and you will obtain the apparent watts input. In the two-phase motor, read the current in both phases, add them together and multiply them by the voltage, giving also the apparent watts input. From the manufacturer of the machine you can obtain curves showing the efficiency and power factor for various loads. Now multiply the apparent watts input by the proper power factor and you have the real watts input.

Question No. 2—If a transformer be connected on the secondary side to a three-wire system, would there be any discrepancy in the voltage if the load were considerably unbalanced?

Answer—If a transformer having a regulation of  $1\frac{1}{2}$  per cent. be connected to a primary line on which the voltage is kept constant, the secondary voltage will be  $1\frac{1}{2}$  per cent. lower at full load than at no load. If the transformer be built for three-wire service (all are not really suitable for such work), and one-half of the secondary be loaded full, then we would expect the voltage to drop in proportion to the regulation of the whole transformer, but this is not quite the case. The drop would probably be nearer to 2 per cent. than to  $1\frac{1}{2}$  per cent. This, however, would be a satisfactory regulation, and as it is extremely doubtful that in actual service one side of the transformer would be fully loaded when the other side was light, except in the case of a blown fuse, the matter is far from being serious. If we loaded the transformer the way you mention, and got a drop of 2 per cent. on the loaded side, and then gradually applied a load to the unloaded side, the two per cent. would gradually decrease to the point where the loads were equal, and both sides carried their full load, when it would be  $1\frac{1}{2}$  per cent.

Question No. 3—How may the inner globes of arc lamps be satisfactorily cleaned?

Answer—One of the best known methods involves the use of hydrofluoric acid. If the deposit is light use the acid in a dilute form, if burned to the glass, use the full strength acid. The objection to this method of cleansing lies in the fact that repeated washings weaken the glass, which is dissolved to a certain extent by the acid.

Question No. 4—I wish to reverse the direction of mo-

tion of a compound-wound dynamo. What changes in connections must be made to obtain this result?

Answer—You can do this by a transposition of the leads from the brush holders to the terminal block, being careful to disturb none of the other connections. Then reverse the brush holders themselves so that they extend from the studs in the opposite direction from the original one. That is, they must act in a similar way with regard to the commutator with the rotation reversed as they did under the original operation. No other changes are necessary.

Question No. 5—A motor in use by one of our customers is acting very erratically in regard to its consumption of current, sometimes taking an extra heavy current under normal conditions. Can you give me any information as to the reason for this?

Answer—Your statement of your trouble is too meagre to allow a definite answer to your question. The rush of current to the motor points to the reversal of a coil in the armature. To test for this apply current separately to each of the coils and hold a magnetic needle over the excited coil. If there is a reversed coil it will be detected by the needle completely reversing. It is only necessary to change the connections of the coil terminal to remedy this defect.

Question No. 6—Is it quite safe to start a new motor under full rated load?

Answer—No; this is poor policy. Your new motors should be allowed to run light for a short time in order that the bearings and brushes may be accustomed to the existing working conditions. When first starting up under load, an eye should be kept on the motor, and the main switch or circuit breaker opened at the least sign of trouble. Place an ammeter in circuit to ensure that the motor is taking the correct normal load.

### The Ever-Reliable Chloride Accumulator

The satisfactory application of storage batteries to telephone exchanges is shown by the fact that the Bell Telephone Company have but recently, for the first time, renewed the plates in their Toronto North Exchange batteries, which have been in constant service for over eight years. The battery consists of 11 G.21 type cells in lead lined tanks having a capacity of 200 amperes for eight hours. The Bell Company have also just installed at their St. Louis Exchange, Montreal, a battery of 11 cells. Each element consists of 41 plates and has a normal 8-hour rating of 400 amperes, with containing tanks designed for an ultimate capacity of 500 amperes for 8 hours. The Booster battery consists of 11 E.11 type cells in glass jars with a capacity of 25 amperes for 8 hours. Another smaller battery which has been installed at St. Catharines, consists of 11 F.11 cells in glass jars, with a capacity of 50 amperes for 8 hours and a Booster set of 11 E.5 normally rated at 10 amperes for eight hours.

These cells are all of the well known "chloride accumulator" type, as manufactured by the Electric Storage Battery Company, of Philadelphia, for which the Canadian General Electric Company, Limited, are the sole representatives for the Dominion.

This company reports an ever increasing demand for the "chloride accumulator," which is made for all purposes, from street and electric railway regulation, to small motor car and laboratory testing work.



## Book Reviews

**Manual for Engineers**—By C. E. Ferris, B.S., University of Tennessee, publishers (13th edition); price, 50 cents. A most useful compilation of 150 pages of tables and other engineering data.

**Motorman's Practical Air Brake Instructor**—By Geo. R. Denehie; F. J. Drake & Company, Chicago, publishers. A treatise on the construction and operation of the different air brake equipments used in modern electric transportation. The principles of construction and action are set forth in plain language, and correct methods of operating the different systems are fully explained.

**Practical Armature and Magnet Winding**—By H. C. Horstmann and V. H. Tousley; F. J. Drake & Company, Chicago, publishers. This little book tabulates in a concise form the modern methods and practice of armature winding. The information contained in it is purely practical and to some extent, in the early pages, elementary. Sufficient space is devoted to the theoretical side of the subject to enable the practical man to understand the precautions that must necessarily be followed. The book should prove a valuable addition to the engineer's library.

**Railway Troubles and How to Find Them**, by Paul E. Lowe, M.E. Cloth; 367 pages. Price, \$1.50. Frederick J. Drake & Company, Chicago.—In this book the author makes a very complete treatise of electric railway apparatus, including motors, control systems, air brakes, etc. Methods of making repairs are extensively gone into, and some valuable information has been gathered together by the author. An interesting chapter is one devoted to questions and their corresponding answers. The book is well illustrated throughout.

**Electric Power Conductors**, by Wm. A. Del Mar, A.C.G.I., Assoc. Mem. A.I.E.E., etc; D. Van Nostrand Company, New York, publishers, \$2 net. The purpose of this book is to present a clear account of all the engineering considerations which affect the purchase and use of such conductors. The book is practical, up-to-date and brief. Its arrangement follows the rational order of the series of considerations which affect the purchase of conductors, viz., the detection of material, insulation and size, the specifications, test and installation. The illustrations are numerous and clear cut and the general appearance very pleasing.

**Transmission Line Crossings**, by F. F. Fowle (D. Van Nostrand Company, New York, publishers). Price, \$1.50 net. Illustrated. An up-to-date treatment of the dangers of high tension long-distance transmission and how best to avoid them. It has not been deemed feasible by the author to prepare a general specification which will cover all crossings of high potential wires, but it has been his aim rather to outline a form of specification which would cover the general principles involved, the materials to be used, the types of construction, etc. The make-up of the book is good and the matter is presented in an attractive form.

**Grounded Electric Transmission and Electrolytic Corrosion**, by J. Stanley Richmond, Mem. A.I.E.E., Mem. Amer. Electro-Chem. Soc., etc. Paper; 69 pages. Price, 50 cents. Canadian Engineer, Toronto.—The author in this small book treats largely of electrolytic reactions in relation to street railway operation. After a preliminary review chapter, including in tabulated form the available literature upon the subject in question, chapters are devoted consecutively to earth voltage and

potential measurements, track drops, stray transmission measurements, voltage contour lines, rail joint bonding, lowering track drops, transverse stray transmission, and prevention of electrolytic corrosion.

**Alternating Current Motors** (McGraw-Hill Company, New York, publishers), by A. S. McAllister, Ph.D. Third edition, \$3 net. Covers induction, synchronous and commutator motors fully. It differs from the earlier editions of the work in that it treats fully the essential features of the recently developed "split pole" variable-ratio synchronous converter, and brings in new material of much value on synchronous converters, considering them both as motors and condensers. The chapter on "Prevention of Sparking in Single-Phase Commutator Motors" has been greatly expanded. It also contains the latest development of the theory of alternating current motors. The book is to be commended to students of the higher branches of electrical engineering.

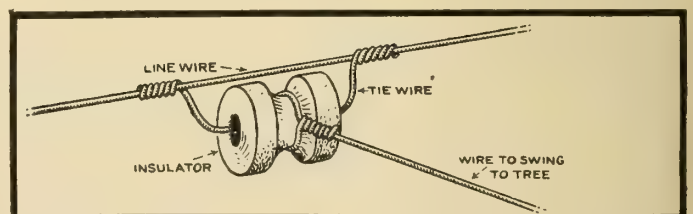
**Hydro-Electro Developments and Engineering**, by Frank Koester, Assoc. Mem. A.I.E.E., etc; cloth; 442 pages; 500 illustrations. Price, \$5 net. D. Van Nostrand Company, New York.—In the first section of this book the author deals with the hydraulics of hydro-electric engineering. While the first two chapters cover largely the theoretical principles of hydraulics and dams, the book is essentially a practical volume and its value is greatly enhanced by numerous illustrations and frequent references to well known existing hydro-electric plants.

Following the introductory chapters, the author launches into a description of the different features entailed in water-power developments, from the construction of the headraces to generation of current, and finally to the transmission service.

**New Electricity for Everybody**, by R. Borlase Matthews, A.M.I.C.E., A.M.I.E.E. 325 pages, Price, 5s. net. London, Eng.: The Electrical Press, Limited. In this hand book the author treats in a popular form the commercial uses made of electrical energy as supplied by the central stations. It contains valuable information as to the manifold ways in which electrical power is and may be utilized in the home, the shop, the factory, etc., and many new ideas are outlined which should enable the general public to take full advantage of the many conveniences which electricity presents. Special mention might be made of Division 11, which deals with the application of current in the home and more particularly in the kitchen and laundry. The concluding divisions treat of electrical energy for power purposes and some useful tables of estimates are included. A final chapter is devoted to the power salesman and some serviceable hints are included.

### A Hint for Rural Telephone Lines

If it be necessary to run a single wire through woods and swamps, swing your line as shown in the diagram. This will save many poles from being placed where possibly it would be hard to keep them standing, especially in the swamps.



Be careful to so run the wire that branches and leaves cannot even touch it when they swing in the wind.



# TELEPHONE TOPICS

## Testing Telephones

By WM. A. TAYLOR.

The testing telephone, for use in the telephone exchange, especially small ones having rural connections, seems almost unknown. Even when these telephones are on hand they are used merely as portable telephones.

The usual testing telephone is but little different from an ordinary magneto telephone, and any difference is in the arrangement of the ringing circuit. For ordinary testing work a telephone with the simple series arrangement of the generator and bell is most satisfactory. The ordinary magneto used for testing electric circuits is nothing less than a generator and bell in series, as shown in figure 1. One side of the generator *G* is wired directly to binding post *A* and the other side to the bell *C*. Terminal *B* is connected with the bell *C*. If a circuit to be tested is attached to the terminal binding posts *A* and *B* and the generator is operated the bell will ring if the circuit is closed and will remain quiet if there is an open circuit. There may be occasions when the resistance of the circuit is so high that the generator cannot force sufficient current through to ring the bell. With the average generator and an 80 ohm bell it is possible to ring through an external resistance of from ten thousand to fifteen thousand ohms. With a ringer of about one thousand ohms resistances much higher may be rung through. It is possible to ring through forty thousand ohms or more with a properly designed generator and bell. With a very sensitive ringing circuit, high resistance faults may be indicated. It is hard to locate foliage grounds ordinarily with any degree of definiteness, and as they frequently cause noisy lines, the necessity of a sensitive bell is apparent.

In figure 2 the complete circuit of a very satisfactory test telephone circuit is shown, including the talking circuit. The bell is of one thousand ohms or higher. The generator *G* is of the series type with a special

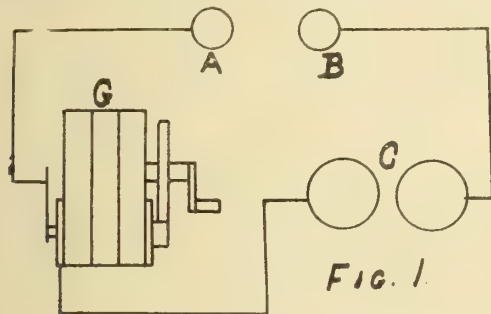
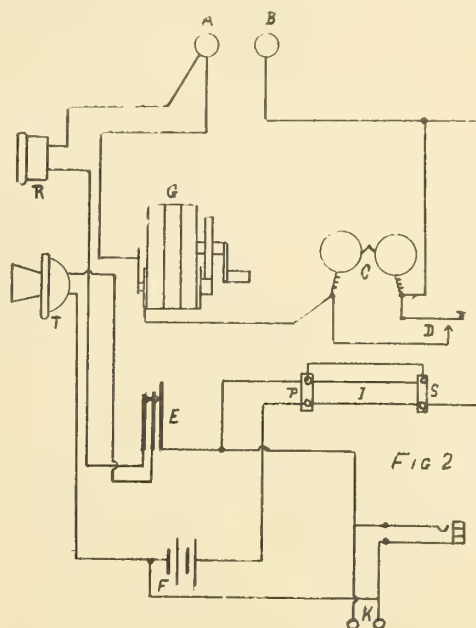


FIG. 1.

winding and extra strong magneto for ringing the telephone on bridging circuits. Normally the armature of the generator is short circuited, so that in receiving a ring the current which passes through the bell will not have to go through the generator winding. As soon as the generator crank is turned the short circuit is removed and the current will flow properly. The difference between this circuit and the regular series circuit lies in the high wound ringer and the push button *D*. When working on bridging lines it would be impossible to ring the bells through the high wound ringer, so the push button is used to short circuit the bell coils. The current from the generator then goes directly to

the line, though it will not ring its own bell. It is not necessary for the generator to ring its own bell when the button is pushed, for if it is desired to know whether there is a circuit the button need not be operated. *E* represents the hook switch springs, but they are usually arranged so that they are operated by the pressure of the receiver, as it lies in a little pocket at the side of the box. Some forms of these telephones have a micro-telephone, that is, a combination of receiver and transmitter on the opposite ends of a handle. The switch *E* is then placed in the handle and is operated by the



pressure of the hand. This is a very convenient form, as the receiver and transmitter are in just the right relation to the ear and the mouth. As soon as the hand grasps the handle, the receiver and transmitter are connected. There is no danger of the battery running down when the instrument is not in use, for as soon as the pressure is removed from the switch springs the battery ceases to flow. In the illustration, No. 2, *J* and *K* represent a spring jack and a pair of binding posts respectively. These attachments are not usually placed on test sets, but are extremely handy for cord testing. A cord may be almost useless and still will show a good circuit for the ringing current. These cords are made of tinsel in order to secure flexibility. After being in use for a time the tinsel wears out and causes bad cutting off. The jack is used for testing switchboard cords. The plug is inserted into the jack. If the cord is good no noise is heard in the test receiver when it (the cord) is shaken, but if the cord is worn enough to cause cutting off, a disagreeable scratching noise is heard. When the connection is made to the jack *J* the current from battery *F* flows through the cord circuit to be tested, the primary *P* of the induction coil *I* and back to the battery. The scratching noise caused by the breaking of the battery current is reproduced in the receiver *R* in the same manner as the voice is reproduced through the induction coil *I*. The binding posts *K* are used for testing receiver cords in exactly the same way as the switchboard cords are tested. There are many circuits that can be nicely

tested by means of the batteries in the test telephones, such as coils of various kinds. By touching the terminals of a coil to the binding posts K a sharp click will be heard in the receiver if the circuit is complete, but there will be silence when there is no circuit. The location of conductors in a cable may be accomplished by this battery test more conveniently than by ringing, though either way will be satisfactory.

Another form of testing telephone makes use of a special generator which generates either pulsating or alternating current. The pulsating current, being always in one direction, does not affect the bells on the line. When it is desired to ring with the pulsating current a switch is thrown which causes the proper current to be thrown on the line.

The testing telephone should be very portable, as it is used a great deal out on the lines. At best it will be heavy to carry, but if the generator is kept as small as possible there will be but little trouble from extra weight.

There is a small form of test set commonly used by linemen of the Bell Telephone Company. This kind consists of the generator and ringer arranged as in figure 1, but it has a low resistance ringer. For talking a special receiver is used with no induction coil or transmitter. An ordinary switch worked by hand connects or disconnects the receiver or ringing set to or from the line binding posts. While this set is light and better than some, it is very inconvenient to use a receiver as a transmitter. The reason for using this kind of test set is because of its low cost, low cost of maintenance and light weight.

There are a number of testing telephones on the market with exactly the same circuits as bridging or series telephones. As testing instruments they are limited, for the bridging telephone is not convenient for ringing out circuits, and the series type is not fitted for work on bridging lines.

A few pointers regarding the use of the telephone under different conditions may not come amiss.

#### To Test Out A Cable With Both Ends Available.

Connect any available conductor with one binding post, preferably one of the battery posts K. Connect a piece of wire to the other post and touch each conductor at the other end of the cable, at the same time holding the receiver to the ear. As soon as the right conductor is touched a sharp click is heard in the ear. If there is no battery test the connections are made in the same way but the operator must ring each time a conductor is touched. As soon as a ring occurs the right wire is in circuit.

**TO TEST A CABLE FROM ONE END.**—Two persons are needed for this test. One terminal of K is wired to the sheathing of the cable and the other end to any wire. At the other end of the cable the assistant has a receiver or a telephone. One side of the receiver is wired to the sheathing and the other is used for running over the wires in the cable. As soon as the right wire is touched a click is heard in the instrument at both ends. Other wires are then hunted out in the same manner. With this method it is well to reserve one of the conductors for a talking wire, and in case of any misunderstanding both parties testing can get into communication with each other. When the cable is not long it is an easy matter to talk back and forth without the medium of a telephone. In case the cable has no metallic sheathing, use the suspension wire or one of the spare wires. Most cables have one extra pair of wires distinctly marked; this extra piece is very handy for the testing conductor.

#### Line Open—One Phone Available.

Disconnect the fuses at the office terminal and test them first. Now connect the outside wire to the binding posts A-B and ring. If there is no ring the trouble is outside of the office. If there is a ring, then connect to the wires running toward the switchboard. If there is no ring, then disconnect at the drop and ring each way. By doing this way the trouble may be quickly located. If the trouble tested out, then go to the end of the cable and, after opening the line, ring both ways. Always restore the line after making a test to save the time of going over the circuit again. If the test shows the trouble still farther out, start out along the line till the telephone is reached. Here disconnect the instrument and ring for the switchboard with the test set. If central is raised the open circuit was in the telephone. If the line still tested open, make a test at the arrestor or at the point where the inside wire joins the outside wire. If the trouble is still shown to be out on the line, test from the pole from which the subscriber's service wire drops. If the trouble is in the open wire it may be necessary to cut it at several places, but generally this will not be necessary, as an open circuit in the line can be easily seen.

#### Short Circuit on a Rural or Party Line.

This kind of trouble is sometimes very hard to locate, because it will affect the whole line, making it impossible to give service. The best plan is to start from the office, testing each way, being careful to see that the trouble is not in the carbon blocks. If after testing to the end of the cable, everything is clear that far, start out on the line and after examining the line and telephones carefully for half the way out, open the wire and test both ways, pushing the button while ringing. In testing toward the office give the office signal. If the office can be called that end is all right and the trouble is still ahead. In testing the other way call one of the telephones on that end of the line. After locating in which direction the trouble remains, continue as before to test by opening the line, provided the difficulty cannot be located otherwise. It is not good policy to cut the circuits frequently, but it is a very good idea to put test connections in the line about every mile. Coils of all kinds may be tested by merely ringing through them.

When a ground occurs on the line it may be located in the same way as a short circuit, except that this test is made between one side of the line and the ground.

Some linemen grow so expert in handling the testing set that they can tell pretty well how far away a short circuit or ground is, by the way the crank of the generator turns. The nearer the cause of trouble the harder the crank turns and the louder the bell rings.

A testing telephone in the exchange should easily pay for itself once a month, besides the help it gives in restoring the lines expeditiously.

Separate cars for women, which were tried in the Hudson tunnels, were withdrawn on July 1, as the experiment proved a failure.

The principal use of platinum is in electric furnaces to withstand high temperatures and in electrolytic apparatus to withstand chemical corrosion.

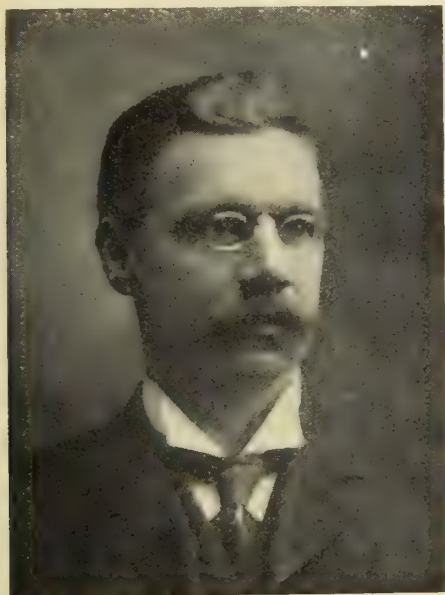
The longest telephone span is claimed to be that crossing Lake Wallenstadt in Switzerland. It is supported by two steel towers 7,827 feet apart, and at its lowest point is 130 feet above the level of the lake.



## Independent Telephone Progress

Mr. Francis Dagger, the newly appointed secretary of the Canadian Independent Telephone Association, whose photograph appears herewith, brings to his work the benefit of a lifelong experience in telephone operation and management. For nineteen years he was in the service of the National Telephone Company of Great Britain, and since his arrival on Canadian soil, ten years ago, he has devoted himself almost exclusively, in one capacity or another, to the upbuilding of the Independent Telephone system in Canada.

In 1903, at the request of the then Postmaster-General, Sir Wm. Mulock, Mr. Dagger prepared a report on the telephone system in Canada as compared with systems in Great Britain and on the Continent, and when, in 1905, a select committee of the House of Commons was appointed to inquire into and seek to remedy the existing conditions, he was appointed technical adviser to that committee. The evidence taken before this committee was printed and widely circulated and doubtless, by its educative value, fostered the enormous growth



Mr. Francis Dagger.

that has since taken place in the telephone field throughout Canada.

When, later, the Manitoba Government conceived the idea of constructing a telephone system of its own, Mr. Dagger was called in to conduct the campaign. Here, as elsewhere, he consistently advocated Government ownership of long distance lines with municipal ownership of local exchanges, and this scheme was finally approved by a large popular majority. Later, following Manitoba's lead, the Government of Saskatchewan took up the telephone question, and again this man of experience was called in. His recommendations here, which were practically adopted in toto, advocated Government ownership of long distance lines, as before, with the additional recommendation that the Government assist the farmers to form local systems. As evidence of the wisdom of this advice, about seventy rural companies have already been formed, and recent advices indicate that Saskatchewan will, within a very short time, be the best telephoned province in the Dominion.

The new secretary's plan of campaign will be to assist in every way possible the promotion of new companies, to strengthen the old ones, to organize the Independent sys-

tem as one great unit and to advocate everywhere and on all occasions government ownership of all long distance lines, but municipal ownership of the local systems.

## German Government Adopts Automatic Telephone Exchange

U. S. Vice-Consul William Washington Brunswick, of Chemnitz, thus describes the working of an automatic telephone system that has been introduced by the German Imperial Postal Department:

"The first automatic telephone exchange system in Germany has just been installed in Hildesheim by the Imperial German Post-Office, requiring no central to make the desired connection, each subscriber being his own exchange. The apparatus is like a clock, with indicating numbers. The Hildesheim subscriber's set, connected to the automatic exchange, is composed of a disk on which are to be found ten holes numbered from the bottom up, 0 to 9. These holes are just large enough to permit the insertion of the average person's forefinger, the holes being on a movable disk. If, for instance, a person desires to be connected with number 951, the subscriber first removes the receiver from the hook, then places his forefinger in the slot numbered 9, and rotates the disk as far as it will go—that is, until his finger strikes an obstruction. He then removes his finger from the slot and permits the disk to return to its normal position under the action of a spring, whereupon the forefinger is inserted in the hole marked 5 and the disk is again rotated until the forefinger meets the obstruction, the disk being again permitted to return to its normal position; the subscriber then places his forefinger in the hole marked 1, again rotates the disk, and lets it return to zero.

### How the Connection is Effected

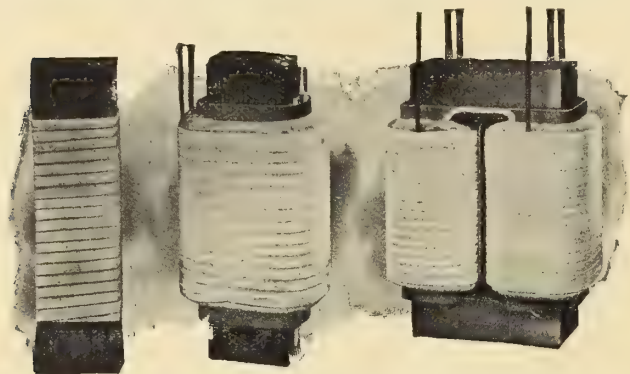
"The manner in which the connection is made is as follows: When a subscriber rotates the disk by placing his finger in the hole 9 and rotates the disk, he sends the requisite impulse over the line to the central office, to move, in the case of number 951, the 100 switch nine steps, or, in other words, the switch picks out the ninth hundred. Similarly, when his finger is placed in the hole 5 and the disk is rotated, it is again rotated through a predetermined angle and sends back to the central office five impulses, which in turn move a final selector, which had in the meantime become connected to the 100 switch above referred to, five spaces, which will correspond to the 50s in this particular 900; and so again with the 1, until finally the apparatus in the central office has been connected through to line number 951 from the calling subscriber's line. It is not necessary for the subscriber to ring, inasmuch as this is also done automatically.

"The subscriber, having finished, terminates the connection by hanging the receiver on the hook. Immediately another person can be called up. Should the subscriber wish to call while a number is in use, he can get no connection until the user has ceased conversation, and this, of course, does away with the annoying feature in telephones of being interrupted in the midst of a conversation by some one breaking in. By this system the subscriber can readily be connected at any time, whether day or night, and it is evident that it will ultimately do away entirely with the exchange girl, as it reduces the cost of maintenance. The Government is energetically pursuing experiments for the improving of the present telephone system, and this automatic device seems to have solved the problem."



## High Efficiency Transformers

The Moloney Electric Company have placed upon the market a transformer known as type H.E., which signifies high efficiency. The cores of this transformer are composed of silicon steel, which reduces the core loss



to a minimum. Before adopting this material for use in their transformers, long and exhaustive tests were made in regard to the aging of this material. A transformer was placed in use several years ago, the temperature being maintained at 100 degrees C. for a period of  $2\frac{1}{2}$  years. At this excessive temperature the cores showed no trace of aging.



This transformer is manufactured in sizes from .6 to 50 k.w. It is very neat in appearance and well constructed throughout, as can be seen from the illustrations. The transformer is well insulated and records show that burn-outs from all causes during the last few years have not exceeded one-half of one per cent. They are furnished in standard sizes for use on 2,200, 4,400, 6,600 and 10,000 volt lines, up to and including 50 k.w. They are also furnished for 133,

60, 30 and 25 cycles. Mr. R. E. T. Pringle, Eastern Townships Bank Building, Montreal, is the Canadian agent

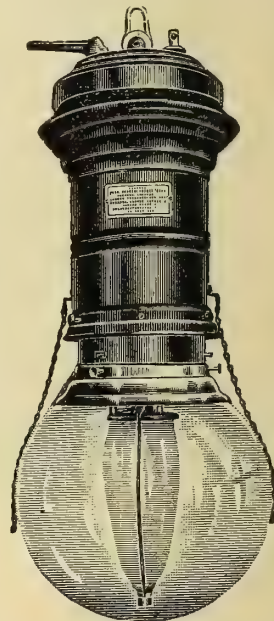
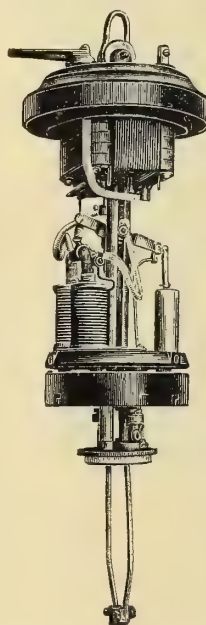
## Sweden Extending Business in Canada

Mr. Victor Brunskog, representing the General Electrical Manufacturing Company, of Sweden, has been paying a visit to Canada to consult with his company's representatives, Messrs. Kilmer, Pullen & Burnham. Mr. Brunskog's company has made several power installations in Canada, including plants at Iroquois, Owen Sound, Wiarton, Fenelon Falls, Elk City, Cobalt Power Company, Listowel, Streetsville, Hanover, O'Brien mine, Grand Falls Power Company, Hamilton Iron & Steel Company, Sauble Falls, etc. The main factory of the company is located in Westeras, Sweden, but subsidiary factories are located in London, Eng., and Helsingfors, Finland, which are chiefly equipped for making stock motors. This company has made some very important installations in various parts of the world and among the big contracts which they have handled are the following: Five alternators, 23,000 electrical h.p., 250 r.p.m., for Rjukanfos, Norway, 11,000 volt; four alternators, 13,000 h.p., 250 r.p.m., for the Svaelfgos Power Company, Norway, 11,000 volt; four alternators, 13,000 h.p., 187

r.p.m., for Trollhattan Power Company, belonging to the Swedish Government, 11,000 volt; twelve transformers, 3,500 kilowatt, single-phase water cooled, 60,000 volt, for Trollhattan; two steam turbine generators, 3,500 k.w., 1,500 r.p.m., for Sydvaranger, Norway; the complete electrical equipment, including motors, cars and overhead construction work for Stockholm, Gothenburg, Malmo street railways; also for Abo and Helsingfors street railways, Finland; Helsingfors inter-urban railway; two 1,000 h.p. express locomotives, single-phase, for the Swedish Government railways.

## The Helios A. C. Arc Lamp

The difficulties met with in alternating current arc lamps are two-fold—the deposition of carbon on the electrodes, which, not being readily volatilized often causes trouble in relighting, and the humming sound, always more or less present in the alternating magnet. It is claimed for the Helios type of arc lamp that it overcomes both of these difficulties. By carefully balancing the weight of the moving parts of the lamp mechanism, as shown in cut, only small magnets are required, which, being weak in proportion, make practically no noise. The "chattering" is prevented by a specially designed dash-pot which restrains the rapid separation of the carbons when the current is turned on. This slow



separation of the electrodes further allows to the carbon deposit on the electrodes, a longer period in which to reach the temperature of volatilization and the resultant gases assist in establishing the arc which is thus drawn slowly and steadily.

The lamps are adapted for either multiple arrangement on a 110 or 220 volt circuit, or for series arrangement on a higher voltage, and can be used equally well at 25, 60 or 140 cycles. The Canadian agent for this lamp is Mr. A. H. W. Joyner, 6 Wellington street east, Toronto.

**Port Arthur Street Railway.**—The appeal by the Board of Electric Railway Commissioners of Port Arthur from an order of the Ontario Railway and Municipal Board, requiring the appellants to give up possession to a new board, and restraining the appellants from meddling with the Port Arthur Electric Street Railway, was dismissed with costs.



## Siemens Open Toronto Branch

The Siemens Brothers' Dynamo Works, Limited, of London and Stafford, Eng., announce the opening of a Canadian branch, under the management of Mr. A. S. Herbert, with offices in the Canadian Birkbeck Building, Toronto. It is the intention of this company to further extend their business connections in Canada by establishing a number of such branch offices, and also by opening a repair shop where a large stock of spare parts will be carried.

The Messrs. Siemens have made a specialty of such electrical apparatus as hoists, pumps, compressors, blowers, etc., for use in mining operations; the electrical equipment of steel works and rolling mills; telegraph and telephone and electric signalling devices for railroads and fire alarm systems. This name will also be remembered as associated with recent experiments in high speed railways, when velocities up to 130 miles were obtained.

## Tungsten Lamp Company's Expansion

The Canadian Tungsten Lamp Company have recently absorbed the Midland Electric Company, whose complete stock of glassware shades and sundries has arrived just in time to occupy the spacious new wing extension the Hamilton Company have added to their Cannon street factory. Manufacture has already commenced of the "Kolloid-Wolfram" tungsten lamp, special interest attaching to their new mercury vacuum pumps, which are working most successfully and have apparently overcome the difficulty so often met with in lamps with imperfect vacuum.

## New Connector for Aluminium Feeder

Mr. Irving Smith, Canadian agent, states that at the Denver convention Dessert & Company, New York, exhibited a new mechanical connector for use in making tap-offs from aluminum feeder cables to copper branches. The connector is similar to the standard Dessert cable tap with the exception that the hook part of the connector is cast in aluminum while the shank is cast in copper and supplied with copper sleeve and compression nut, thus giving contact of aluminum to aluminum and copper to copper. The two metals are cast together to preclude absolutely the possibility of air or moisture intervening. The design has been accepted by the Milwaukee Railway & Light Company, which has ordered 1,000 for installation on its new aluminum feeder line.

## Telephones in China

In all China, with its 400,000,000 population, there is virtually no telephone service, for the 2,000 instruments in the whole empire are in private use by foreign residents in that country. These are the old, hand-ringing, obsolete kind, and they are practically individual connections between the homes of the foreign residents. But the installation of a general telephone system in Peking indicates that the long spell of national slumber has been broken. It is to be the best telephone service that can be provided. After canvassing the systems of the world the Chinese commission preferred the bids and the equipment of the American company which manufactures the Bell telephone equipment to those of English, French, German and other foreign manufacturers, who were not contestants for the big contract. The American installation is to be complete in Peking beginning with two switchboards, one at each end of the city, costing \$150,000. Afterwards plants will be installed in Tien Tsin, Canton, Hankau and other big cities of China.

## Current Literature

**Low Head Hydro Electric Development**—A description of a 6,000 k.w. plant at Kilbourn, Wis. The plant is operated under the relatively low head of 17 feet. The desirability of using large generator units required the employment of six turbine wheels on each shaft, each giving 450 h.p. on full load and 270 h.p. with 12 foot head. The penstocks are constructed of reinforced concrete in the form of vaulted structures in which the runners are submerged.—*Electrical World*,

**Types of Alternating Current Commutator Motors and the Best Frequency for Railways**—F. Eichberg. The author investigates the influence of frequency on the generators, transformers, transmission line and more especially on single-phase commutator motors.—*Electrician*.

**Leakage Resistance**—J. Rezelman. Deals with the leakage resistance of the stator windings of alternating-current machines, the rotors being removed. The leakage flux is separated into its component parts, for several machines, by means of experiments; the effect of the type of winding upon the overhang leakage and the relationship between the reactance of the windings in three-phase and in single-phase working is observed. Formulae are given by means of which the stator reactance can be calculated.—*The Electrician*.

**Apparatus for the Rapid Electro-analytical Separation of Metals**—H. J. S. Sand.—The author describes an apparatus which is an improvement over one previously designed by him for this purpose. It is more portable and easier set up. A potentiometer containing all the apparatus required for the measurement of the potential of the electrode in a single box, is also described.—*The Electrician*.

**Ionization of Air by High-tension Overhead Wires**—L. Houllévigüe.—The author has performed a series of experiments in the neighborhood of a 3-phase, 50,000 volt transmission line. It has generally been believed that such wires are continually giving out ions, but the experiments in every case showed that there were practically no ions close to the wires—the number being much less than in the surrounding country.—*Comptes Rendus*.

**Theory of the Alternate-current Generator**—T. R. Lyle.—It is pointed out that the theory of armature reaction as ordinarily discussed by electricians is unsatisfactory as an important effect due to the mutual induction between the current in the field winding and the current in the armature circuit is neglected. The author gives a method of arriving at the complete solution.—*Phil. Mag.*

**New Five and Six Speed Three-Phase Motor**—The Maschinenfabrik Oerlikon has recently succeeded in designing a motor with six speeds by arranging the poles in six different ways and still only employing two stator windings. The article describes a motor of this type designed for five speeds. For this particular type the stator is wound with three different windings.—*The Electrician*.

**The Resistance and Reactance of Armored Cables**—J. B. Whitehead.—The author calculates the reactance of armored cables under various conditions. Theoretically this may be from 2 to 4.5 times that of unarmored cable, the factor increasing with the distance between the go and return cables. Actually the reactance is about 0.7 of the theoretical value. The effective resistance is about 1.6 to 2 times the dead resistance. The impedance with a separation of 12 inches is about 3 times the dead resistance at 60 cycles, and about 1.7 to 2 times that at 25 cycles.—*The Electrician*.

**Calculation of Transmission Lines**—J. E. Dalemont.—A new method for calculating lines with reactance. Two simple formulae are given by means of which the size of conductors and the voltage regulation of any transmission line with reactance and with any power factor can be calculated. The method is exemplified by application to three special cases, indicating the ease with which the required information may be obtained.—*Electrical World*.

"Some Users and Their Opinions" is the title of the May bulletin issued by Reavell & Company, Ipswich, England. It contains a lengthy list of users. This firm also describe their vertical oil engines for use with paraffin, kerosene, petrol, alcohol, town or producer gas in pamphlet No. 19. Messrs. Vandeleur & Nichols are their agents for eastern Canada.



# Current News and Notes

## Aylmer, Ont.

The Aylmer Express is trying to rouse the people of that town to get after Niagara power, now that their electric light and water plant is demolished.

## Bridgeburg, Ont.

Mr. Greer, solicitor of the Canadian Niagara Power Company, was here recently seeking a franchise for his company.

## Brantford, Ont.

It is rumored that the Grand Valley Railway Company will extend their system to London next year.

It is stated that the B. & H. radial intended erecting a power house in the near future.

## Barrie, Ont.

John W. Moyes, of Toronto, has roughly outlined a proposition by which Barrie would have a street railway. He proposes to connect the C. P. R. and C. N. R. at Atherley with the C. P. R. at the thirteenth concession of Essa by an electric line.

## Bonaventure, N.B.

The Bonaventure Telephone Company are rushing their telephone line and it will soon be possible for Campbellton merchants to telephone to Bonaventure and Gaspé points. A large crew of men are at work on the construction of this line, and poles have been erected and copper wire strung from New Carlisle to Sandy Hill station. These wires will connect with the New Brunswick Telephone Company's lines at Matapédia, and work is being rushed, so that the service will be complete this fall.

## Carnduff, Sask.

The erection of a new lighting plant will be commenced at once.

## Cornwall, Ont.

The Board of Trade have endorsed the scheme of the St. Lawrence Power Company and the Long Sault Development Company to dam the Long Sault Rapids and develop 500,000 h.p. The Government will be asked to sanction the scheme. The company first propose to straighten the south channel, and build a dam from the foot of Long Sault Island to the south shore. This will develop from 65,000 to 100,000 h.p. At this dam will be a big lock for steamers, overcoming the rapids in one lift. They estimate that this work will take four years. The damming of the big rapids, the enlarging of the little river or international channel north of Barnhart's Island, and the building of power houses will take seven years, and will cost ten or twelve millions. When completed there will be a dam 3,800 feet long and 40 feet high from Long Sault Island to Barnhart's Island.

## Cranbrooke, B.C.

The Cranbrooks Electric Light Company have made arrangements to install a seven thousand dollar power house and thirty thousand dollars of new machinery. This will be the basis of instituting a twenty-four hour service.

The Kootenay Telephone Lines, Limited, of this city, are pushing forward the work of extending their lines east and south as rapidly as possible and within a short time will have connection with the government lines in Alberta, and the Bell

lines in the State of Washington. This will mean that Cranbrook will have communication both east and south with virtually the entire country.

## Creston, B.C.

The Creston Power, Light & Telephone Company is just putting the finishing touches on its new telephone system. There are about 15 miles of line ready for operation, and the switchboard and distributor in the company's head office are installed. This company has run a number of private wires through the town and connected with different suburban lines now in operation. It is said that arrangements for long distance connection are about completed.

## Dundas, Ont.

The McGuigan Construction Company have begun work on the transmission line from Dundas to Guelph, a distance of about thirty miles. The other line from Dundas through Woodstock to London will be begun immediately. The telephone system is nearly complete, about 160 miles of poles being already in place.

## Edmonton, Alta.

The city has taken out a permit for the electric power plant and water works, to cost \$39,000.

The Radial Railway Company, it is stated, expects to place contracts shortly for 10 miles of single and double track. C. E. Taylor, electrical engineer.

## Fort William, Ont.

The Kaministiquia Power Company are preparing to make important additions to their plant, which will ultimately increase its capacity one-third. The extension contemplated will entail the construction of a penstock and the installation of additional generators.

## Fort Frances, Ont.

The hydro-electric power plant now nearing completion, will be one of the finest in Canada. Fort Frances will get its power off the wires at \$12 per horse power per annum. The electric lights for street lighting will be installed this month and it is promised that by December the entire lighting system will be in working order.

## Glace Bay, C.B.

It is stated that the wireless station recently destroyed by fire will be rebuilt.

## Gainsboro, Sask.

The government telephone line has been completed down to Gainsboro, at the boundary of Manitoba. Within a few days connections will be made between Alameda and Carlyle, which will complete the system in south Saskatchewan.

## Hartland, Ont.

John E. Stewart and Hon. A. B. Donworth are said to be interested in a plan to build an electric railway from Hartland to Foreston, N.B.

## Hamilton, Ont.

The Dominion Power & Transmission Company have taken out a permit for the erection of a new car barn on Wilson street. Estimated cost \$25,000.

## Lethbridge, Alta.

The new municipal power plant being established at Lethbridge will consist of a 700 horse power boiler equipment in three units, the boilers being operated

under forced draft; a 19-inch engine, belt connected to a 250 kw. generator; a 20-inch engine, direct connected to a 200 kw. generator, and a vertical type engine, direct connected to a third unit of from 250 to 300 kw. generating capacity. Generation is at 2,200 volts, 60 cycles, 2 phase, alternating current. Space is left for future additions to both boiler and generator equipment.

A company is being organized to build and operate a street railway in Lethbridge and connect it with Royal View and other towns in the near vicinity.

## Latchford, Ont.

Tenders addressed to N. Tessier, Secretary, Department of Public Works, Ottawa, will be received until October 28th for the construction of dam and sluiceways across Montreal river. Plans, specifications and forms of contract at office of J. G. Sing, District Engineer, Confederation Life Building, Toronto, and at local post office.

## Lindsay, Ont.

J. A. Culverwell, managing director of the Northumberland-Durham Power Company, lessee of the Healey Falls power, announces that he has completed arrangements with a leading financial corporation for the underwriting of \$2,500,000 bonds for development. Power will be transmitted to Belleville and the cement mills, Deseronto, Napanee and Kingston; also to Port Hope and Cobourg and north to Hamlet, Norwood and the Blairton iron mining district.

## London, Ont.

E. I. Sifton, electrical engineer, is preparing plans for an underground system for the transmission lines of the Hydro-Electric Commission power system and will procure estimates of the cost of the same. The cost of the underground system is estimated at approximately \$70,000.

## Montreal, Que.

The parish of Pointe aux Trembles have awarded to the Saraguay Electric & Water Company, an exclusive franchise for 35 square miles on the Island of Montreal, stretching from Route de l'Isle to Longue Pointe.

## Montreal, Que.

The Montreal & Southern Counties Railway bylaw was carried recently. Work on the new electric line will be started at once.

Tenders are being called by the Saraguay Electric & Water Company for turbo-generators of 2,000 K.W. capacity. Proportionate increase of power house boilers and other equipment will be made likewise. Chas. Brandeis, consulting engineer, 4 Phillips Place.

The chairman of the Fire & Light Committee, Ald. Yates, has a new proposal on the lighting agreement between the city and the Montreal Light, Heat & Power Company, which is being sent on to the council for discussion. It provides for a five-year contract at the following rates: Arc lamps, \$75 per lamp per year; incandescent, 65 c.p. lamps, \$36 per lamp per year; incandescent, 32 c.p. lamps, \$24 per lamp per year.

## Morrisburg, Ont.

The ratepayers have voted in favor of giving the Canadian Sheet Steel Corpora-



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tion a 60-year franchise of its hydro-electric power plant and right of way through the principal streets for an electric railway.

#### New Westminster, B.C.

The city council have refused the proposition of the Vancouver Power Company in favor of the erection of a 75-foot dam at Coquitlam Lake, towards the cost of which they were asked to contribute.

The Cloverdale branch of the British Columbia Electric Railway is now completed to a stage which permits of the handling of freight, and during the past few days numbers of carloads of goods for the residents of Surrey have been taken over the new line attached to the work trams. The wiring will be finished in a few days.

#### Nelson, B.C.

The street railway bylaw was passed last week.

#### Niagara Falls, Ont.

The Ontario Power Company will spend \$1,000,000 this winter in laying an additional pipe line from the gate house to the power house.

#### Owen Sound, Ont.

The Georgian Bay Power Company has offered for sale to the town of Owen Sound 1,500 horse power. The price is \$20 per horse power at the falls, or \$24 delivered at Owen Sound. At the present time it is believed that 800 horse power could be disposed of right in Owen Sound, and that outlying towns and towns along the transmission line could use a large proportion of the balance. The power development is at Eugenia Falls.

#### Ottawa, Ont.

Plans are ready for the dam at Kippewa Lake, but the contract has not yet been let. Another huge dam is to be erected on the Quinze river.

An agreement has been reached between the Bell Telephone Company and the Hazeldean Rural Telephone Company. The latter sought connection with the city exchange, but a settlement has been reached whereby the Bell Company will build a line to Bell's Corners, there to join the local company and arrange for interchange of traffic through the long distance service.

Dr. Eugene Haanel, Director of Mines, states that arrangements are being made for establishing the first electric smelting plant in Canada, in connection with the Sault Ste. Marie iron and steel industries. The Lake Superior Company is arranging for the construction of a number of furnaces similar to those now in successful operation in Sweden. A second electric smelting enterprise involving the investment of about seven million dollars, is also contemplated for the treatment of iron ores on the Ottawa river at Chatts Falls, where a splendid power site has been secured by a company headed by Louis Simpson, of Ottawa.

#### Port Colborne, Ont.

It is stated that the extension of the Niagara, St. Catharines & Toronto Electric Railway from Welland to Port Colborne will be undertaken this fall.

#### Port Arthur, Ont.

The city council are considering propositions from James Conmee to deliver power from Nepigon to this city, and also from the Hydro-Electric Commission.

The Municipal Commission on street railways has decided to erect a car-house at Port Arthur for its street railway which it operates in Port Arthur and Fort William.

H. S. Acres, engineer of the hydro-electric commission, is here from Toronto to arrange for the building of a sub-station through which the commission will supply power from Kam Company to Port Arthur.

The city council is considering the formation of a company to work in conjunction with the municipal street railway system and build electric lines through the townships of Oliver and Shuniah. For further information address J. J. Carriek.

#### Peterborough, Ont.

The Otonabee Power Company, who have asked the city for a twenty-year franchise, propose to spend \$250,000 in uniting their two dams.

#### Prince Rupert, B.C.

An up-to-date telephone system is to be installed here by the G. T. P.

Geo. H. Halse, general manager of the British Columbia Telephone Company, visited Prince Rupert recently and it is expected that his company will establish a telephone system here in the near future. The British Columbia Company operates under a provincial charter and is free to build anywhere in the province.

#### Quebec, Que.

The Quebec Street Railway are considering the extension of their road to Cape Rouge.

#### Regina, Sask.

Tenders addressed to S. P. Porter, Deputy Commissioner, Railways, Telegraphs and Telephones, will be received until October 15th for the installation of a telephone system in Hanley and Melville, Sask. Plans, etc., on application to the Department.

#### Penfrew, Ont.

John B. McRae, consulting engineer, has been engaged by the town to report on the advisability of installing a municipal hydro-electric power plant.

Jno. B. McRae, consulting engineer, Ottawa, is busily engaged with Town Engineer Stewart mapping out the work for the proposed waterworks power development.

#### Revelstoke, B.C.

The city of Revelstoke has carried a bylaw to spend \$89,000 on improvements to its power plant. These include a new concrete dam and headworks, flume, 700 horse power turbine, new 600 kw. generator, exciter, new panel for switchboard, and new 50 arc light system. The present single phase system will be replaced by a 3-phase system throughout. Total capacity of power plant to eventually reach 1600 kw.

#### Strathcona, Alta.

Tenders addressed to R. R. Houghton, Secretary-Treasurer, will be received until November 1st for an additional \$15,000 telephone debentures to complete the telephone system in the rural municipality of Strathcona.

#### Sydney, N.S.

The Cape Breton Electric Company have been asked by the city council to make numerous extensions.

#### Simcoe, Ont.

The Norfolk County Telephone Company's application before the Dominion Railway Commission asking that their 800 subscribers have power to connect with the Bell system at Waterford, Delhi, Scotland, Simcoe, Otterville and Port Dover was allowed to stand over pending an endeavor on the part of the two companies to reach a mutual agreement. The Bell

Company's contention is that the granting of the order would give the local concern an unfair advantage, inasmuch as not being required to make any large capital expenditure, they would be able to offer a cheaper service.

#### Sturgeon Point, Ont.

S. Anderson, who is now operating 40 miles of electric railway, is said to be looking into the possibility of a street railway system from Fenelon Falls to Bobcaygeon, passing through Sturgeon Point.

#### St. Catharines, Ont.

Plans are being made by the Niagara, St. Catharines and Toronto Railway Company to construct a rotary transformer station with an output of 500 k.w.

#### Toronto, Ont.

Tenders will be received until October 28th for electric motors. Particulars may be had from the city engineer.

The Hydro-Electric Power Commission expects to be in a position to supply power to the city in March of 1910. Engineer Dow, who has charge of the distributing plant, is also confident that the city will be ready by that date.

Mr. W. A. Littlejohn, city clerk, acting on the request of the council, has written the Brantford city council inviting their co-operation in urging upon the Ontario government the advisability of municipal ownership of telephone systems throughout the province.

Mr. R. C. Harris, property commissioner, has asked the property committee for power to rearrange some rooms in the basement of the City Hall to provide more accommodation for the electrical department which is very much needed.

Considerable headway has been made toward deciding upon the standardization of the equipment of the various municipalities in reference to the hydro-electric power scheme. It has been decided that 25-cycle power shall be used throughout, that rotating machinery shall be dispensed with wherever possible, and that static transformers shall be used. No motor exceeding 10 horse power shall be run from lighting lines.

The Hydro-Electric Commission will shortly call for tenders for the construction of a power transmission line to supply Port Arthur and Fort William with power generated at Dog Lake.

The Bell Telephone Company has applied for permission to erect poles and string wires on the followings streets: Lyall avenue, Kimberley to Wayland; McCauley avenue, Perth to G. T. R. tracks; Perth avenue, Earnest to McCauley; Conduit street, Willoughby to Western; Western avenue, Conduit to Center; Eastern avenue, Sumach to St. Lawrence; Annette street, Lakeview to Elizabeth; Elizabeth street, Annette to Pine.

#### Victoria, B.C.

Five wireless plants are being installed by the government, viz., at Gonzales Hill, Paschena, Deluge Point, Triangle Island and Prince Rupert. Apparatus for the three first named points have already arrived and the work of installation is in progress.

#### Vancouver, B.C.

Tenders have been called for the construction of five sub-stations along the line of the British Columbia Electric Railway Company from New Westminster to Chilliwack. The buildings are to be of concrete construction, and will be used for the distribution of light and power to the surrounding districts as well as in connection



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tion with the operation of the tram system.

The Burrard Power Company has received from the Dominion Government a grant of 25,000 miners' inches of water on Lillooet river. Under the terms of the grant the harnessing of the waters of the Lillooet will be commenced at no distant date, and as the power plant will be only 23 miles from Vancouver, it is declared that it will not be long before some sections of industrial Vancouver will be drawing power from this source.

The owners of block 119, Burnaby, have been notified by the British Columbia Electric Railway Company that a right-of-way has been selected through the Eastbourne tract. Work will be begun on the tram line in 30 days.

As a solution of the electrolysis difficulty the British Columbia Electric Railway propose to install a negative feeder to which the water mains will be bonded. Under the present system bonds connect the mains with the street railway tracks.

Negotiations are in progress between the city council and the British Columbia Telephone Company with a view to placing the telephone wires within a certain area, underground. The cost of placing the street conduits, exclusive of the cost of laterals, is placed by the company's engineer at \$75,000.

**Vernon, B.C.**

Plans are rapidly maturing for the development of a water power on Shuswap river, 25 miles from Vernon. It is proposed, as a beginning, to build a railway westward from the power plant to Vernon. Sufficient power can be developed at this point, it is said, to electrify the entire Okanagan valley.

**Waterloo, Ont.**

Waterloo is negotiating with an independent telephone company for the installation of a system in that town.

**Welland, Ont.**

Fred. D. Corey, Buffalo, N.Y., is reported to have applied to the Town Council for a franchise to operate an electric railway over certain streets of Welland. The proposed railway is to extend from Port Colborne through Welland and Port Robinson, Ont., to Niagara Falls, N.Y.

The commissioners of Queen Victoria (Niagara Falls) Park have given permission for another large undertaking by the Ontario Power Company. The company will spend over a million dollars in laying another pipe from the gate house to the power house. The new pipe is to be the same diameter as the old, eighteen feet, but instead of being steel, encased in con-

crete, it will be wholly of reinforced concrete.

**Winnipeg, Man.**

The United Wireless Telegraph Company, which owns wireless telegraph stations along the Atlantic and Pacific coasts, propose erecting a string of such stations across Canada. The first plant is now being installed in Port Arthur, and it is expected work will be commenced in Winnipeg before the end of the year.

The Street Railway Company will again be asked to extend their Selkirk avenue line from Sinclair to McPhillips street.

A new telephone exchange is to be built on Sherbrook street at a cost of \$50,000. J. J. Kelly, contractor.

The street railway company have obtained permission to double track their line from the north end car barns to the city limits.

Smith, Kerry & Chace, Carnegie Library Building, have plans for the construction of dam at Portage la Prairie.

**AWARDED.****Collingwood, Ont.**

The Water and Light Commission have awarded to the Crossley Bros., of Manchester, England, at \$4,332, f.o.b. Liverpool, the contract for a gas-producing plant for the water and light station.

**Lashburn, Sask.**

The Canadian General Electric Company have secured the contract for one chloride accumulator of 60 E-9 cells from Canadian Fairbanks, Limited, Winnipeg, together with controlling apparatus for operating one hundred 25-watt Tungsten lamps for five hours.

The contract for electric wiring in the new Carnegie library has been awarded to F. C. Whatmough, electrical contractor, Stratford, Ont.

**Toronto, Ont.**

The contract for one 650 kilowatt, 120 r. p. m. engine type alternator, together with switchboard, steam driven exciter and motor generator set, has been awarded to the General Electric Manufacturing Company, of Sweden, through their representatives, Kilmer, Pullen & Burnham, Toronto. Mitchell, Ont.

**Winnipeg, Man.**

The contract for the West End exchange to be erected here by the Manitoba Government Telephone Commission has been let to J. J. & J. M. Kelly, of this city, at \$43,000. The switchboard will be installed by the Northern Electric & Manufacturing Company.

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119,615. F. M. G. Johnson, Montreal, Que.; continuous electrical switches. An electric switch comprising a permanent terminal, a movable member provided with a pair of projecting spring fingers, a loose contact member and means for causing the fingers of the movable switch to carry the contact member alternately into and out of engagement with the fixed terminal.

119,855. A. O. Tate, Toronto, Ont.; assignor to Tate Accumulator Company, of Canada, Limited; bi-functional storage battery plates, consisting of a storage battery containing a number of bi-functional plates, each plate being provided with anode and cathode strips having mechanical separators between them. The anode strips of these plates are connected in multiple with a common conductor, whilst the cathodes are connected similarly to another common commutator.

120,274. D. Handfield, Montreal, Que.; automatic electric fire alarms. Relates particularly to that type of fire alarm, where the alarm circuit is completed by the fusing of a given substance, when a predetermined temperature has been reached. The device comprises a normally open electric circuit, one of the contacts of which is contained within a casing. A leaf spring is mounted in the casing, the said spring having one end secured to the remaining contact of the circuit while the opposite end is bent to form a hook which projects

through a slot in the covering of the case to engage the fusible member

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(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hrs.
Nov. 1	5 30	Nov. 1	9 30	4 00
2	5 30	2	10 30	5 00
3	5 20	3	11 30	6 10
4	5 20	5	0 40	7 20
5	5 20	6	1 40	8 20
6	5 20	7	2 40	9 20
7	5 20	8	3 40	10 20
8	5 20	9	4 40	11 20
9	5 20	10	5 40	12 20
10	5 20	11	6 00	12 40
11	5 20	12	6 00	12 40
12	5 20	13	6 00	12 40
13	5 10	14	6 00	12 50
14	5 10	15	6 00	12 50
15	5 10	16	6 00	12 50
16	5 10	17	6 00	12 50
17	5 10	18	6 10	13 00
18	5 10	19	6 10	13 00
19	5 10	20	6 10	13 00
20	10 10	21	6 10	8 00
21	11 20	22	6 10	6 50
23	0 40	23	6 10	5 30
24	1 50	24	6 10	4 20
25	3 10	25	6 10	3 00
26	No Light	26	No Light	
27	" "	27	" "	
28	5 00	28	7 20	2 20
29	5 00	29	8 10	3 10
30	5 00	30	9 20	4 20

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40 Watt	}	200 to Volts 240
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80 "		
100 "		
200 "		

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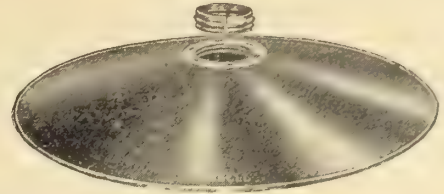
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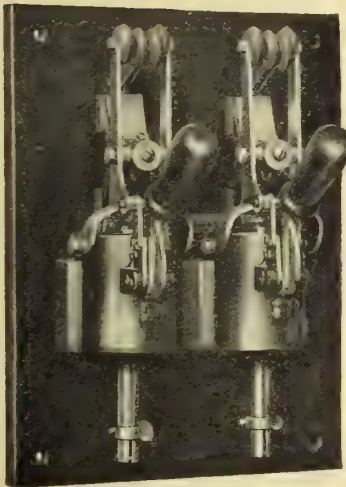
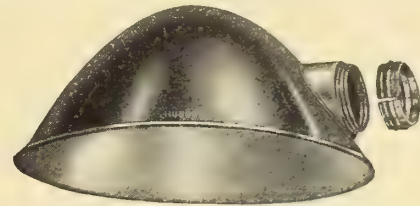
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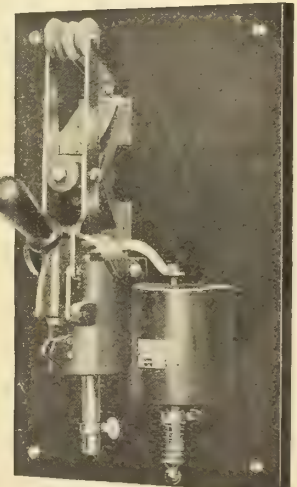


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**Electrical Contracts Awarded****Cobalt, Ont.**

The contract for 60 transformers in sizes of 160 K.V.A. and less for the Cobalt Power Company has been awarded to the General Electric Manufacturing Company, of Sweden, through their representatives, Kilmer, Pullen & Burnham, Toronto.

**Calgary, Alta.**

The contract for the construction of the general works for the Calgary Power and Transmission Company has been awarded to the Walker-Fyshe Company, of Montreal. Smith, Kerry & Chace, engineers.

**Lashburn, Sask.**

The Canadian General Electric Company have secured the contract for one Chloride Accumulator of 60 E-9 cells from Canadian Fairbanks, Limited, Winnipeg, together with controlling apparatus for operating one hundred 25 Watt Tungsten lamps for five hours.

**Montreal, Que.**

The contract for 500 kw. steam turbo-generator for the Saraguay Electric and Water Company has been awarded to the Canada General Electric Company, of Toronto. Charles Brandeis, Montreal, consulting engineer.

**St. Timothee, Que.**

W. T. Nicholson, Eastern Townships Bank Building, Montreal, has awarded to the Nova Scotia Construction Company, of Montreal, a sub-contract, amounting to approximately \$200,000, in connection with the Canadian Light & Power Company development work at St. Timothee.

**Toronto, Ont.**

The Hydro-Electric Commission has awarded the contracts for electric cranes and hand cranes to Royce & Company, Ancaster, Eng., and the Mussen Company, Limited, Walkerville, respectively.

The Board of Control has decided on the recommendation of Electrical Engineer Aitken and City Engineer Rust, to arrange with the Hydro-Electric Power Commission for the installation at the city's distributing station of sixteen feeder switches at a cost of \$2,000 each.

**Vancouver, B.C.**

The contract for 55 D-7 cells of Chloride Accumulator with charging and controlling apparatus has been awarded to the Canadian General Electric Company. This battery will have a momentary discharge of 120 amperes, and will be used for operating and controlling high tension switches at the power house of the British Columbia Electric Railway.

**Verdun, Que.**

I. Collins, Montreal, has secured the contract for the new power house here. Chas. Brandeis, Montreal, consulting engineer.

The following contracts have been awarded for the municipal electric light plant: Electrically driven sewer pump, capacity 10,000 gallons per minute, Gouls Pump Company, of Montreal; two 300 h.p. compound condensing steam engines, Belliss & Morecom, Limited, Birmingham, Eng., Laurie & Lamb, Montreal agents; two 235 K. V. A., 3-phase engine type generators, with direct connected exciters, also complete switchboards, Canadian Westinghouse Company, Limited. Tenders are being called for boilers, condensers, crane, etc. Charles Brandeis, Montreal, consulting engineer.

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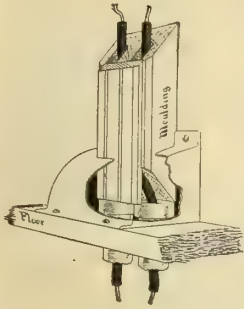
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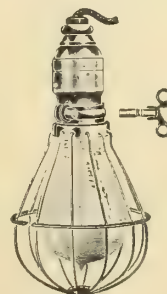


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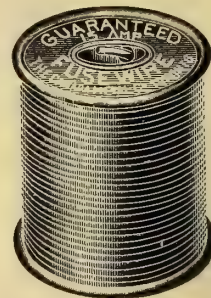
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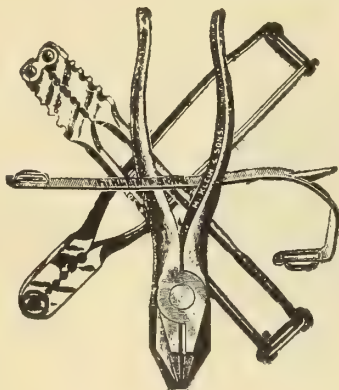


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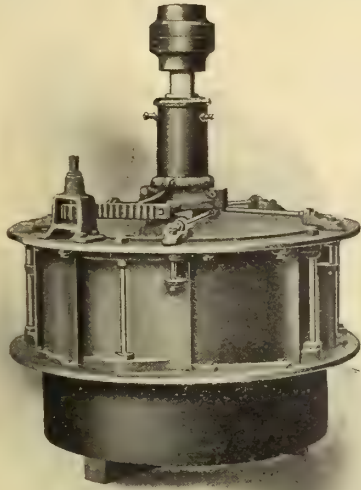
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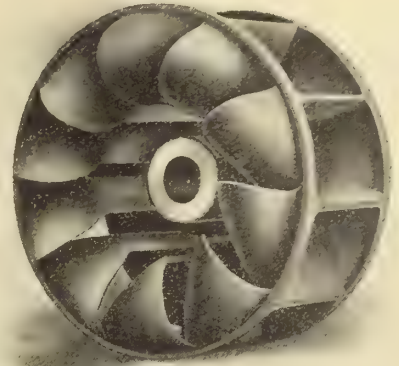
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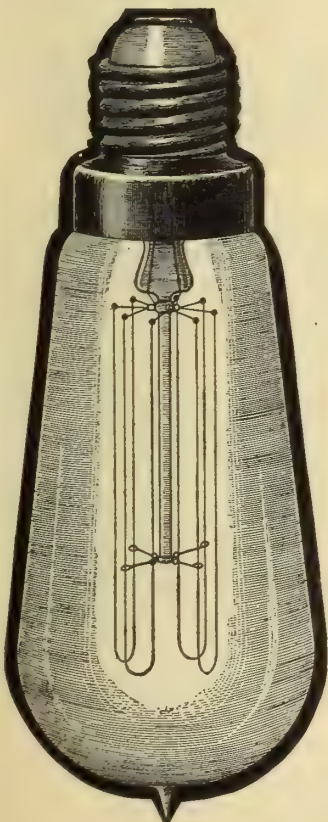
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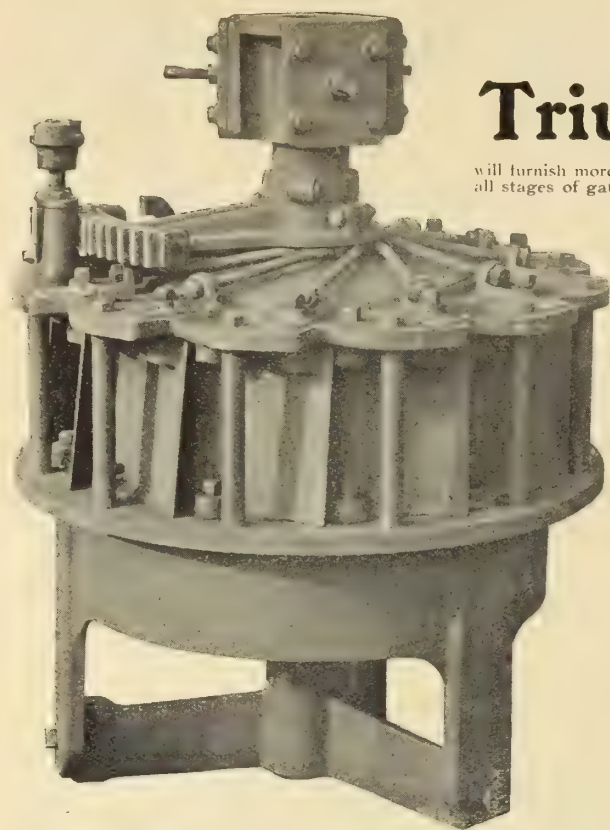
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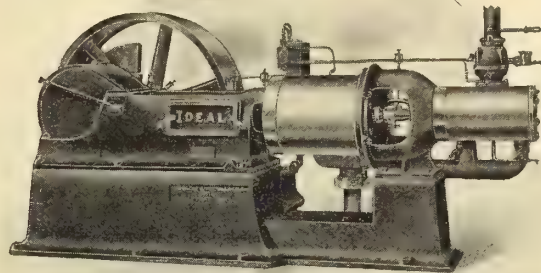
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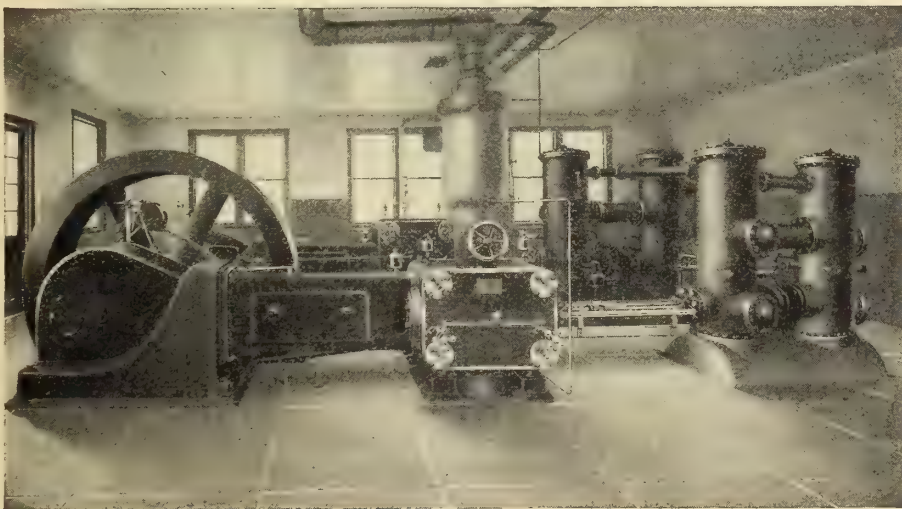
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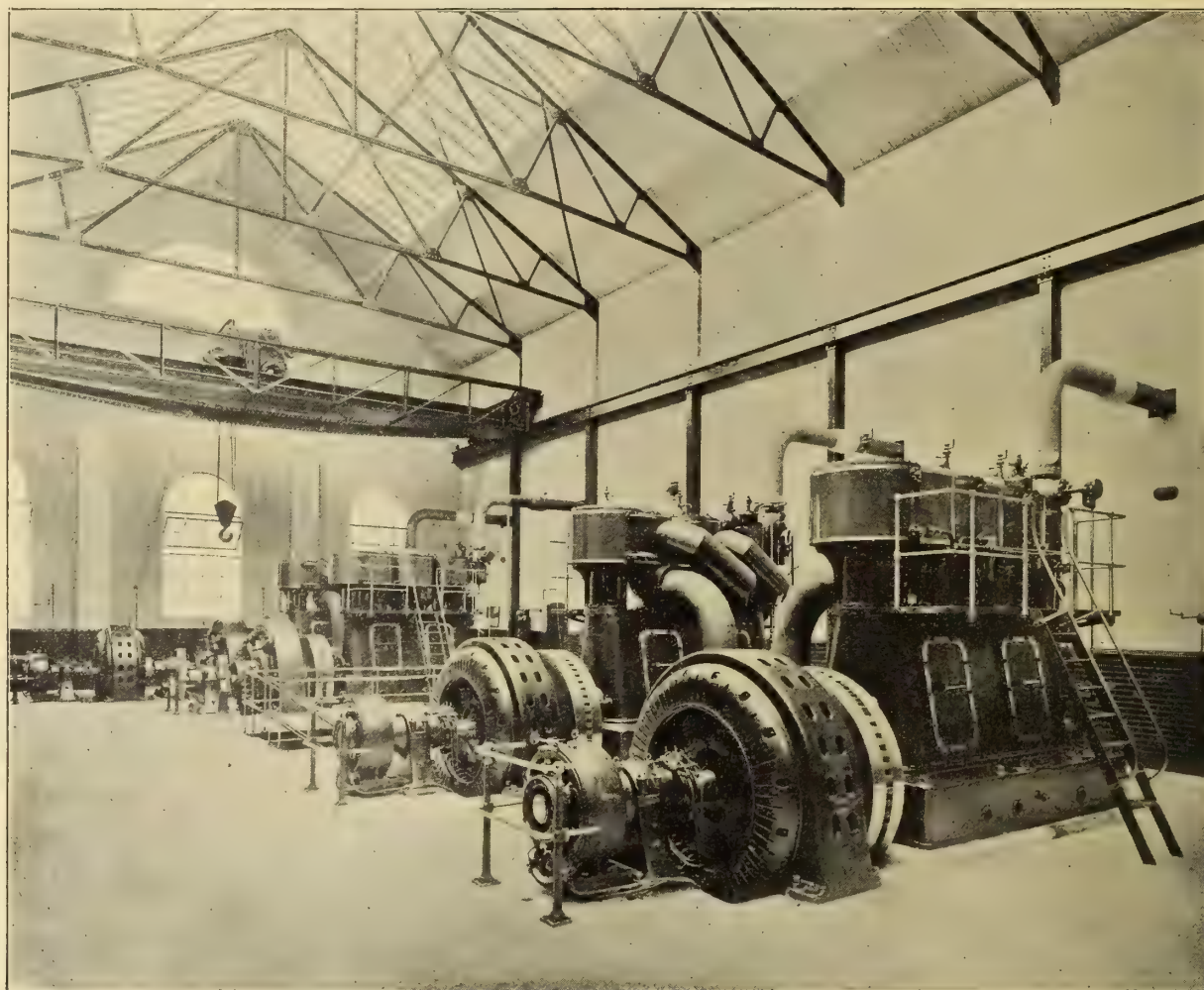
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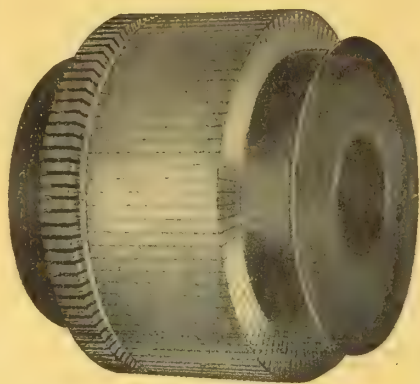


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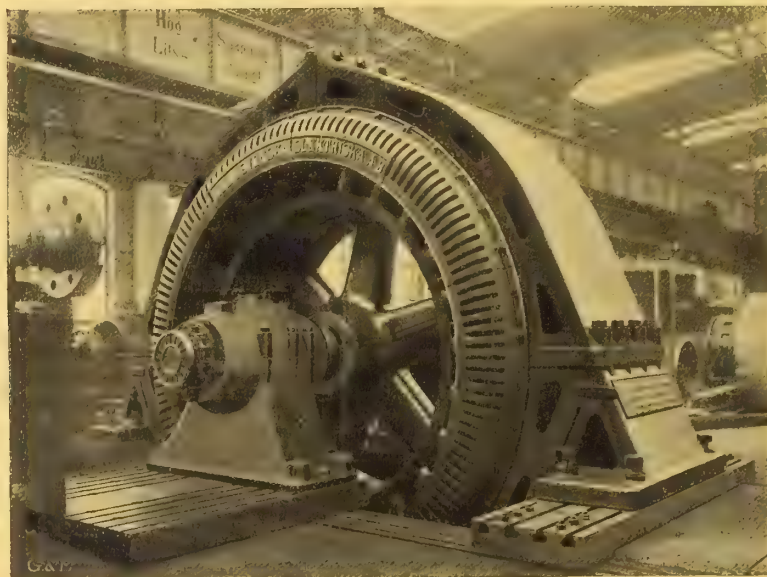
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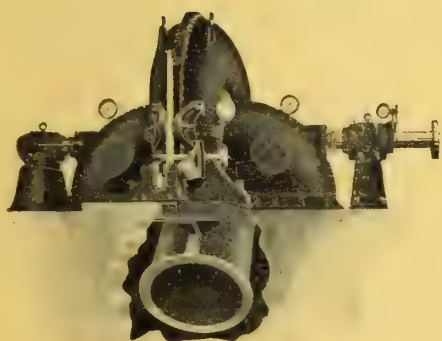
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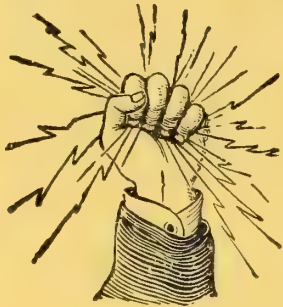
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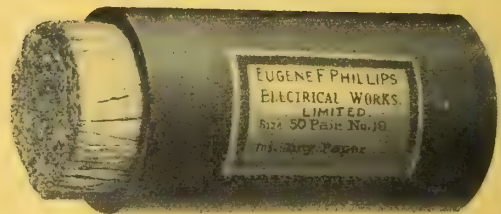
# PHILLIPS



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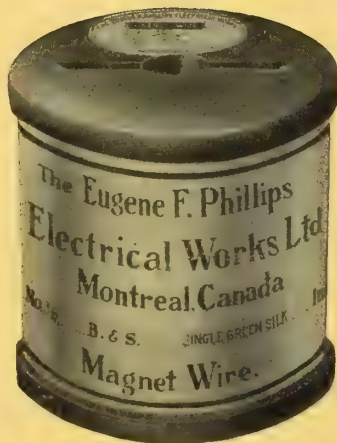
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Cat. No.	List Price
3340 Absorber only, with canopy support	\$0.50
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For Absorber less top strap deduct 5 cents list	



Cat. No. 3340

With top strap, Absorber becomes a hickey threaded to fit insulating joint; with strap removed it may be used as crowfoot. Springs with different degrees of tension are furnished to provide for fixtures of different weights, to-wit: 1-4 lbs.; 4-10 lbs.; 10-16 lbs. Canopy is attached to stationary support—not the fixture stem. It is held by a short piece of brass tubing telescoping the casing and fastened to the stationary element—therefore retains its position regardless of the vertical movement of the fixture. The device has enough play to allow fixture to hang plumb. Any suitable canopy with  $\frac{1}{4}$ -inch slip may be used. Prices do not include canopy shown.

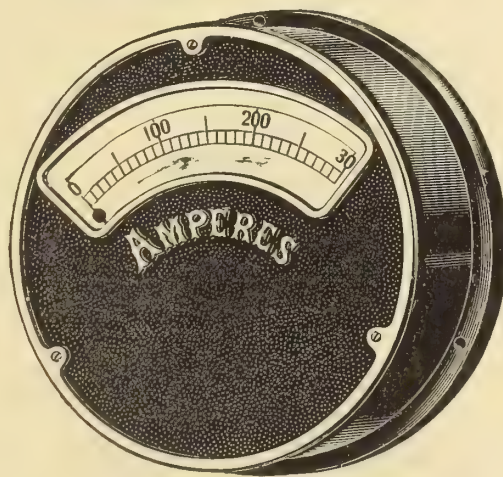
**SPECIAL NOTICE:** If specified, this Tungsten Shock Absorber will be furnished with our open and enclosed Tungsten Arcs listed page 21 of Catalog C19, without extra charge. In ordering Shock Absorber only, specify the approximate weight of the fixture.

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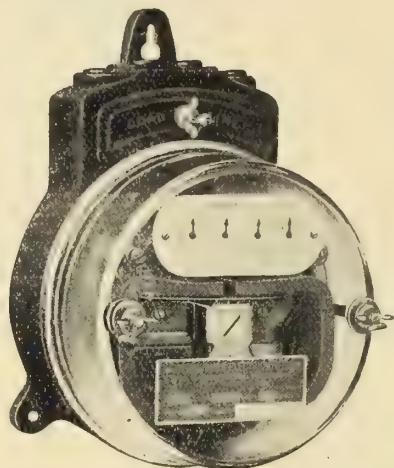


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The simplest, sturdiest and most dependable of integrating wattmeters. The rotor is an aluminum disc revolving, on jeweled ball bearings, in a rotating field created by the shunt and series windings. The retarding torque is provided by permanent magnets whose lines of force cut the disc, inducing retarding eddy currents. This simple motor-generator action, connected to a registering train, comprises the ideal measuring element used in Westinghouse Integrating Wattmeter. ::

Send for Illustrated Folder 4065

## Canadian Westinghouse Co., Limited

GENERAL OFFICE AND WORKS: HAMILTON, ONT.

For particulars address nearest Office:

Traders Bank Bldg.  
TORONTO.

439 Pender St., VANCOUVER.

922-923 Union Bank Bldg., WINNIPEG.

232 St. James Street,  
MONTREAL.

158 Granville Street, HALIFAX

# "DIAMOND H"

## SWITCHES

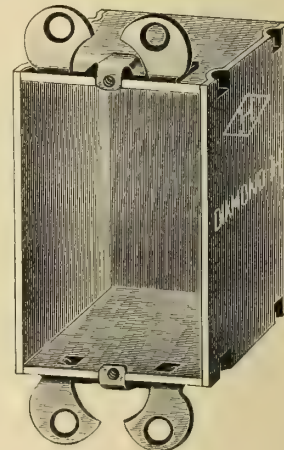
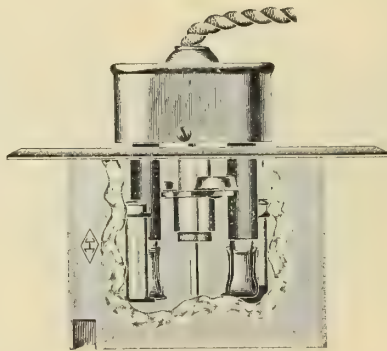
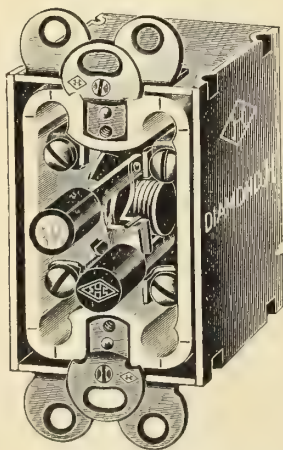
Push Switches  
Door Switches

Rotary Switches  
Standard Switches



## APPLIANCES

Galvanized Steel Wall Cases  
Automatic Flush Receptacles and Plugs



MANUFACTURED BY THE HART MANUFACTURING CO., HARTFORD, CONN.

Canadian Agents:

**C. W. Bongard Co., Ltd.,**

62-64 Wellington Street West  
**Toronto, Can.**





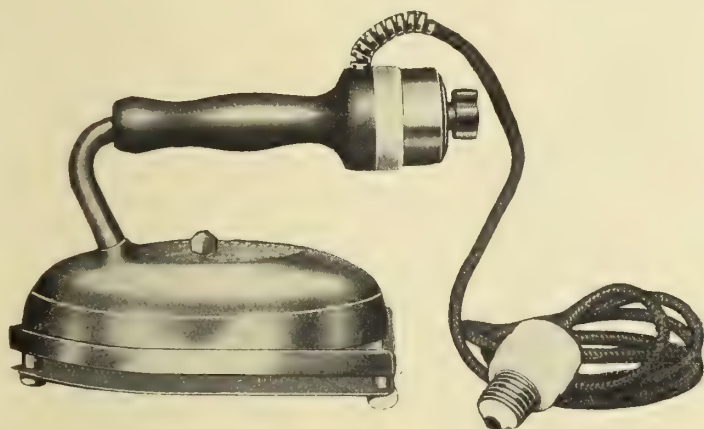
# Our "Diamond HH" Electric Toasters and Irons

are the "Latest Word" in Electrically Heated Devices

The most economical and substantial devices yet placed on the market. They embody a host of new patented features not contained in other irons and toasters. They're surprising in quality and more surprising in price.

## The New "Diamond H H" Electric Irons

(PATENTS PENDING)



The illustration shows our new 6 lb. domestic iron for household work and light manufacturing. It is carefully designed so as to distribute the heat evenly throughout, and it has the additional advantage of a sleeve iron. An indicating Diamond "H" switch mounted on the handle as shown on cut gives absolute control over the temperature of the iron without having to pull a plug or reach up to turn off socket. The heat containing portion is one solid piece which when heated through gives a steady even heat, no matter how light or heavy the work. The element is simple, durable, efficient and easily removed. A heat insulating safety stand is furnished with each iron.

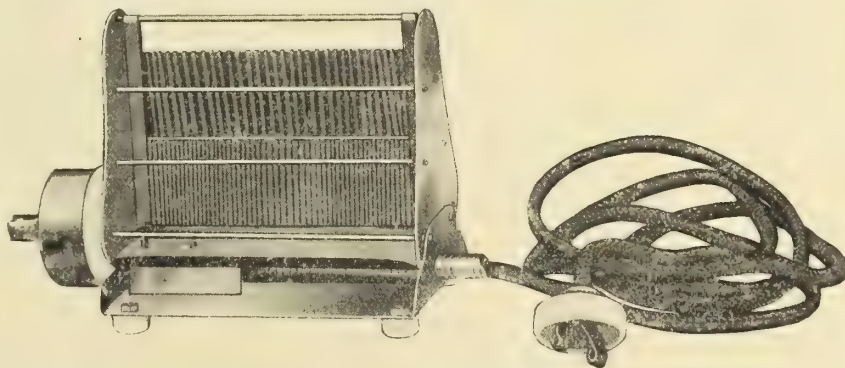
Our heavy duty irons are arranged with a Diamond "H" electrolier switch mounted on the iron, which does away with rheostats. These irons have three heats, the 1st for light, the 2nd for medium and the 3rd for heavy duty work, and to quickly bring the iron to the required temperature. This heat controlling device is a great saver of current.

## The New "Diamond H H" Electric Toasters

(PATENTS PENDING)

The size illustrated will toast two large slices at once. The bread is toasted by radiant heat, not by currents of air, and can readily be removed when browned. The heat is distributed so that entire surface of the bread is evenly toasted. The heat insulating base is so perfect that if left on the table for hours it will not injure the linen. The indicating Diamond "H" switch at the end allows the heat to be turned off without the inconvenience of rising to the socket. This type of toaster is adaptable for small families and apartment housekeeping.

Our larger sizes will toast 4 large pieces or six small pieces at once. An electrolier indicating Diamond "H" switch on the end of the toaster allows control as follows: (1) First turn of switch operates half the toaster, or toasts two slices. (2) Second turn operates all the toaster for four large slices. (3) Third turn reduces to a lower heat for keeping toast warm after making. This is the most economical and efficient toaster on the market. Write for prices and particulars regarding sizes.



Complete stocks on hand to fill rush Xmas orders. Attractive discounts to the trade.  
Write for prices and bulletins.

**C. W. Bongard Co., Limited,** 62-64 Wellington St. W. Toronto, Ont.

# “Kolloid-Wolfram”

REGISTERED TRADE MARK

## Tungsten Lamps

Have You Seen Our New Price List

None genuine without the central support and spiral filament

Highest Efficiency

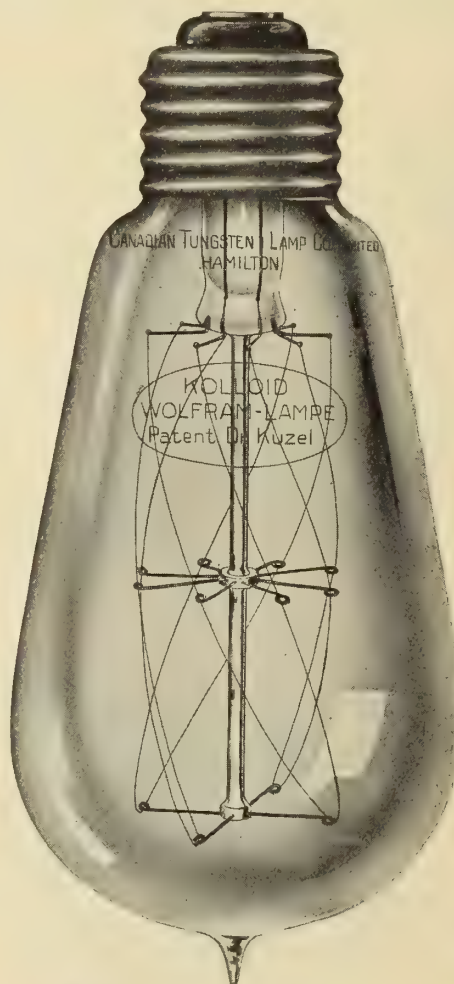
Economy

and Excellence

Long Life

Burn at any angle  
on D.C. or A.C.

Pure White Light



Made in the following C.P.s.  
and Voltages:

5, 10 and 16 c.p. in 25  
volts

16, 20, 25, 32, 40, 50, 75  
and 100 c.p. in 110, 115,  
120 and 130 volts

32, 50, 75, 100, 200 and  
250 c.p. in 220, 225 and  
250 volts

Also in Spherical and  
Miniature Lamps

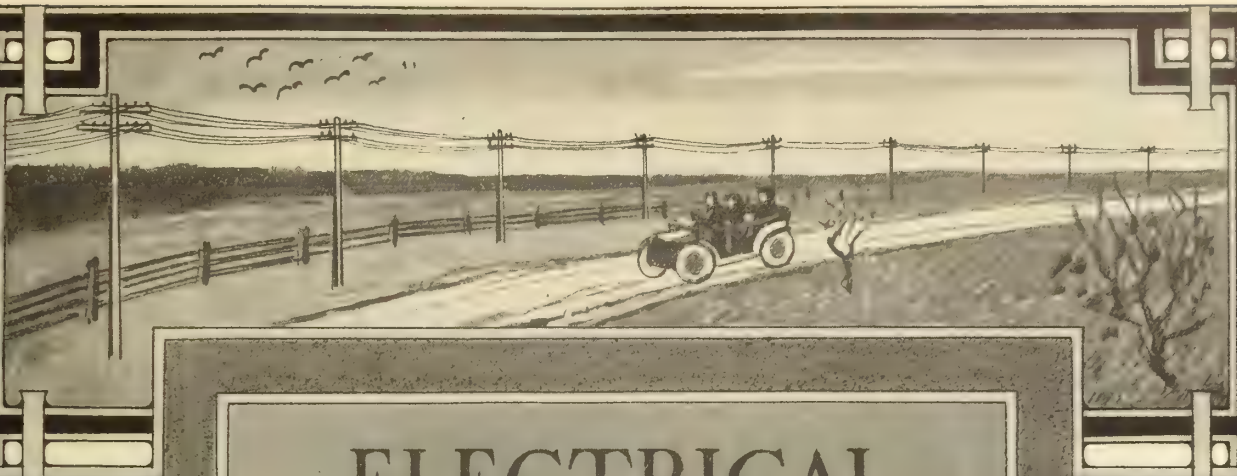
The  
**Canadian Tungsten Lamp Co.**  
Hamilton - Ontario Limited

We also manufacture  
all kinds of the highest  
quality Carbon Lamps,  
“Brilliant and Eureka”

Operating the  
**ONTARIO LANTERN & LAMP CO.**  
Limited

And a full line of Original  
Designs in plain  
and fancy Glass Shades



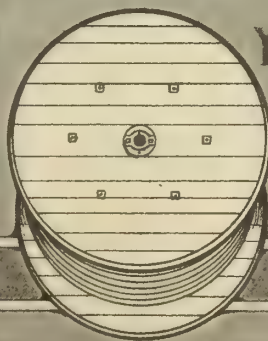


# ELECTRICAL WIRES AND CABLES FOR ALL PURPOSES

Power Cables, Lead Covered Cables  
Paper and Rubber Insulated Cables  
Rubber Covered Wire  
Weatherproof Wire, Armature Wire  
Bare Copper, Brass and Magnet Wire  
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Etc, Etc, Etc,

LET US ESTIMATE ON

YOUR REQUIREMENTS



*The* WIRE & CABLE CO  
HEAD OFFICES • • • MONTREAL



# Canadian Carbon Co.

Limited

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Makers of

## X CELLS

the only Batteries which show  
**NINE LIVES**

and which have PROVEN to  
give HIGHEST SATISFAC-  
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Dealers who handle X CELLS make money.

Look for the **RED TOP** on the New Model  
1910. Don't take others.

The **BLACK CAT** with the **RED TOP** for  
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Prompt Shipments from FRESH Stock.



Sole Importers of

## Fabius Henrion Carbons

which are the only carbons in the world made by  
AUTOMATIC MACHINERY. This explains their  
ABSOLUTE UNIFORMITY. Our FRENCH CAR-  
BONS last longer than others and owing to the  
enormous output of the factory

**700,000 Carbons daily**

can be sold CHEAPER although being BETTER  
than any other make.

Prices on NEW LONG LIFE CARBONS for  
ENCLOSED Arc Lamps.

$\frac{1}{2}$  x 12 in. Solid.....\$18.95 per 1,000.  
 $\frac{1}{2}$  x 12 in. Cored.....\$19.50 per 1,000.

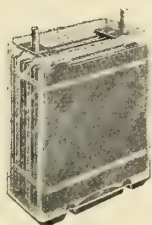
Other sizes proportionate. Prompt Shipments.

## Northern Electric & Manufacturing Co., Limited

Winnipeg - Regina - Vancouver

Distributing Agents for the Northwestern Territory

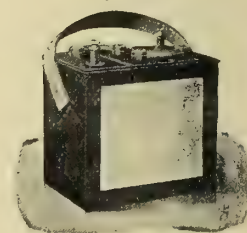
Vulcan  
Accumulator



"Made in Canada"



Vulcan  
Sparker



"Made in Canada"

## The Superiority of "Vulcan" Storage Batteries is due to

Exact tests of material used in their construction

Improved and superior methods of plate formation

Accurate tests of the finished batteries to insure efficiency, capacity and uniformity

**Long Life, Light Weight, Durability and Evenness of Discharge**

are qualities which distinguish Vulcan Storage Batteries from the ordinary kind. All special  
features are protected by "Madigan" patents.

## The Croftan Storage Battery Company

423-425 West Queen St.

TORONTO, CANADA

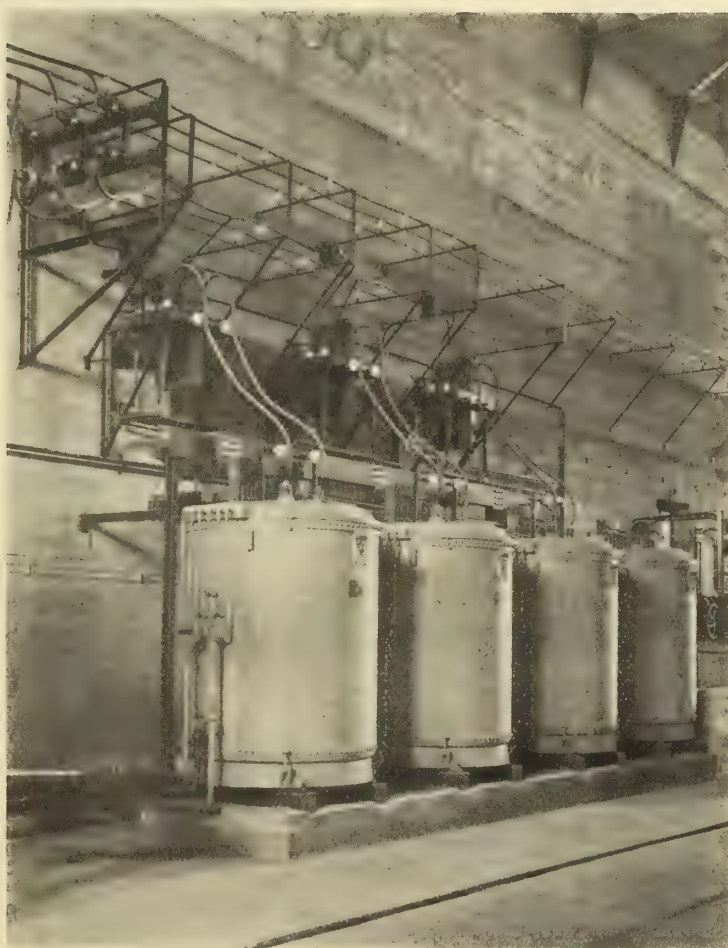


*Packard*

# Transformers for Power Distribution

## Bulletin 103

Large  
Transformers  
for  
Power  
Distribution.



## Bulletin 104

Small  
Transformers  
for  
Central Station  
Distribution.

4-800 k.w. 12,000 V. 25 Cycle Transformers

Part of an installation of 14 Packard Power Transformers in works of the  
American Cyanamid Co. at Niagara Falls, Ont.

The

# Packard Electric Co., Limited

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# \$ Money \$

is more plentiful, so it is said ;  
but as yet there is not such a  
surplus of that commodity  
apparent that you can afford  
to be without our latest lists  
and discounts.

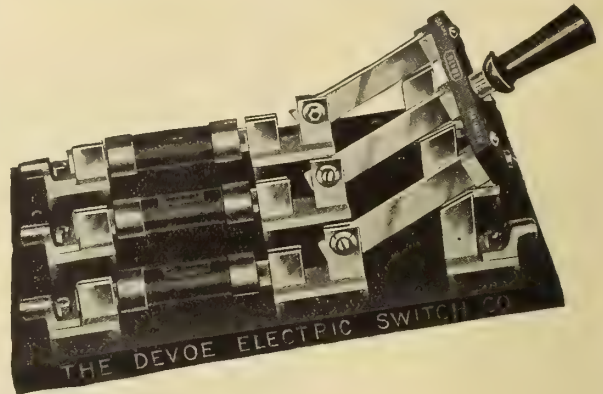
Write to-day for Bulletin 1a

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**Hill Electric Switch & Mfg. Co.**  
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# Panel Boards

Are you looking for the very best panel  
boards to be had? You simply can't go  
wrong by using ours.



Type "B" Switch, 250 Volts. Front connected for  
National Electrical Code Fuses.

We also want to quote you on that next  
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The **Devoe Electric Switch Co.**  
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are preferred by Engineers and Contractors  
where good Engineering and Construction  
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PRICE CONSISTENT WITH QUALITY

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2000 Volt Motor Starting Apparatus

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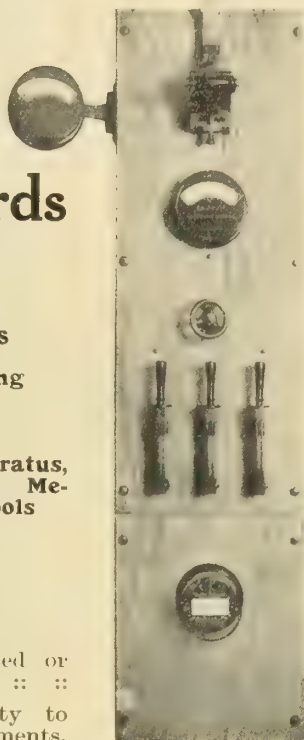
Special Electrical Apparatus, Commutators, Special Mechanical Apparatus, Tools

Metal Novelties

Metal Devices

Special Machinery designed or built to specifications. :: ::

We solicit an opportunity to quote on your requirements.



## New Weston Eclipse Direct Current Switchboard Ammeters, Milli-Ammeters and Voltmeters



are of the "soft iron" or **Electro-magnetic** type, but they possess so many **novel and valuable characteristics** as to practically constitute a **new type of instrument**.

Their **cost is exceedingly low**, but they are **remarkably accurate, well made and nicely finished** instruments, and are admirably adapted for general use

in **small plants, the cost of which is frequently an important consideration.**

Correspondence concerning these new Weston instruments is solicited by the

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Berlin—Weston Instrument Co. Ltd., Ritterstrasse, No. 88

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" Bonds	

Pure Copper Transmission Cables

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Any diameter. 2 to 7 Strands

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Branch Toronto

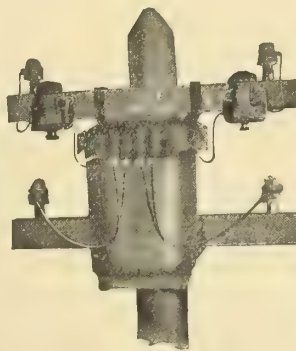
## You Can Reduce Your Transformer Expense

and increase your receipts by using

## "Moloney"

High Efficiency

## Transformers



because they show remarkably low core losses. We have the best of good reasons for believing that these losses are lower than can be shown by any other transformer in the market. We back this belief with a guarantee that they will not exceed certain definitely specified amounts. The savings effected by these reduced losses should amount to about 20%.—you save the purchase price every five years. Write for proof.

## Moloney Electric Co.

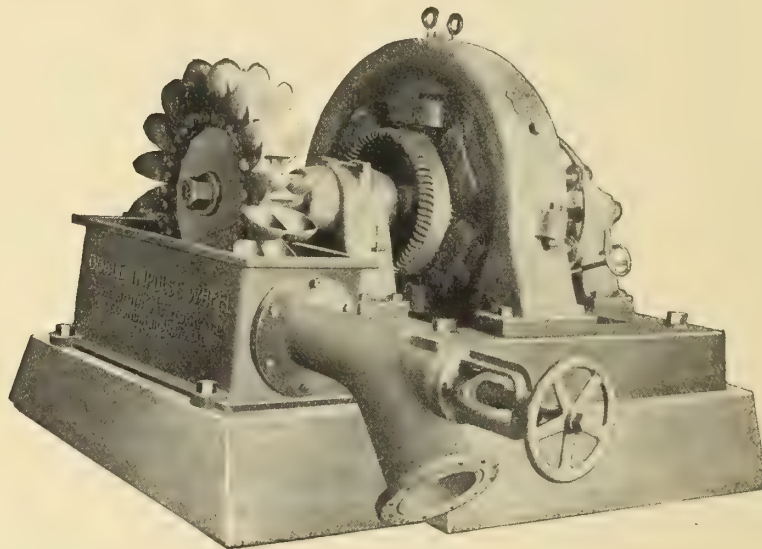
St. Louis, Mo.

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Western Sales Office: 603 Union Bank Bldg.  
Geo. A. Powell, Manager, Winnipeg

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SIMPLE IN CONSTRUCTION  
EASY TO OPERATE  
HIGH IN EFFICIENCY



**100 H. P. Doble Impulse Wheel**  
driving 180 K. W. Generator

In the illustration the cover has been removed from the wheel. Note the ellipsoidal buckets. The water jet enters without shock and is discharged along natural lines over the entire bucket surface. The full force of the water is employed in useful work and consequently the efficiency of the wheel is very high. See Bulletin No. 7.

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LIMITED**

Works: Montreal. Sales Offices: Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

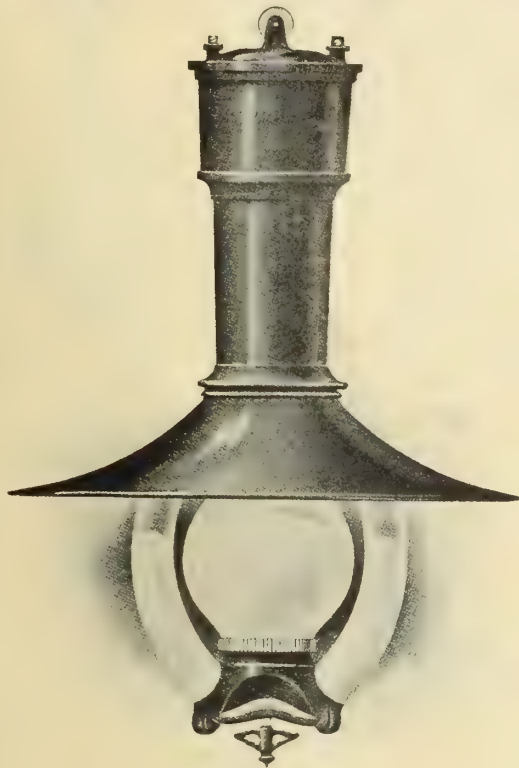


# Engineering Equipment & Supply Co.

13 St. John Street, MONTREAL

## "EXCELLO" Electrical Specialties

TRADE MARK



REGENERATIVE

The longest burning Flame Arc lamp in the world, 70-80 hours without trimming.

AC or DC

Most effective distribution of light.

Write for Bulletin

Headquarters for

Flame Arc Lamps

Weston Instruments

Locke "Victor" Insulators

Hartman Oil Circuit Breakers

"Excello" Incandescent Lamps

Tungsten Lamps

Arc Carbons, Imported

Jandus Fans



SHOWING four "Victor" Suspension Insulator Units under severe rain test at 205,000 volts; also a 65-ft. steel tower equipped for 100,000-volt operation. This is part of an experimental tower line at Victor, 800-ft. span, running up to 350,000 volts.

*"Victor" insulators are good and they are safe.*

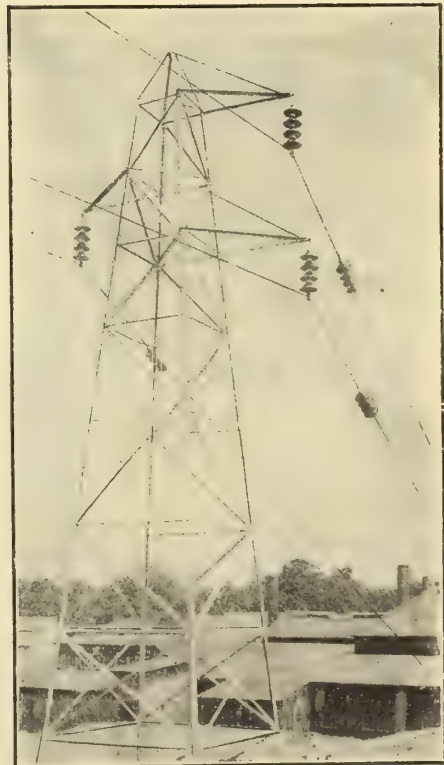
**The Locke Insulator Mfg. Co.**

Victor, N. Y., U. S. A.

Montreal Office:

**The Engineering Equipment & Supply Co.**

13 St. John Street





# Arc Lamps for all Circuits

We are Specialists in the Manufacture  
of Arc Lamps.

Send in Your Specifications or at least Write for Bulletins

**The Adams-Bagnall Electric Co.**  
Cleveland, Ohio

Canadian Representative

**R. E. T. PRINGLE, Room 209 Townships Bank Bldg., Montreal, P. Q.**



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**A**LUMINIUM, the lightest and one of the most useful of the industrial metals, is coming into increasing favor amongst metal users. Here's one way, in particular, that it may be used to big, money-saving advantage:

# ALUMINIUM WIRE

for transmission service. It has less than half the weight of copper of the same conductivity. Our wire is drawn in Canada from billets supplied by our principals.

At present prices you save from 10% to 20% on your transmission line metal. Now is the time to buy.

Prompt shipment assured from our principals, the British Aluminium Co., Limited, London, the largest works in the British Empire.

**PARKE & LEITH**

205 Yonge St., (Bank of Toronto Building) TORONTO



No. 50785.

## A New Wall and Ceiling Receptacle

Polished Brass and Brush Brass Shell, 3¼ inches in diameter, 2 inches between screw holes. Spring contact. Retains lamp.

This Receptacle fixture of handsome appearance replaces ceiling bands and other expensive fittings. It is in itself an attractive fixture at a minimum cost.

The wise contractor will use it.

MANUFACTURED BY

**The Duncan Electrical Co., Ltd.**

FOR

**The James Stuart Electric Co., Ltd.**

88 Princess Street, WINNIPEG, MAN.

## AUBERT, GRENIER & CO., Cossonay-Gare

(Switzerland)

Telephone and  
Telegraph  
Cables

V. I. R. Wires  
and Cables



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Copper or  
Aluminum  
Conductors

Insulated  
Conduits  
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**PAPER-INSULATED LEAD-COVERED CABLES**





TRADE MARK  
Reg. U. S. Patent Office

## The Standard for Rubber Insulation

Okonite  
Insulated

# Wires and Cables

maintain their high electrical efficiency under the most exacting conditions. They are not affected by extremes of temperature, commercial acids or alkalis. They improve with age.

The plain insulation [without a protective covering] is soaked three days in water before being tested.

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The OKONITE COMPANY,

253 Broadway, NEW YORK, U.S.A.

## What kind of Meters are you going to order?

Are you going to re-order more of the kind you are now using, or do you want something better?

The **Ferranti** is absolutely the best meter made. : : :

**We claim** for them absolute accuracy and durability : : :

Western Sales Office:  
603 Union Bank Bldg.

**Geo. A. Powell**  
Manager **Winnipeg**



Cyclometer Dial, Ferranti A. C. Watt-Hour Meter.

## The Ferranti Meter

fills all requirements

There are a lot of technical reasons why our meters have gained a world-wide reputation, whenever exacting service is required under all conditions : : : :

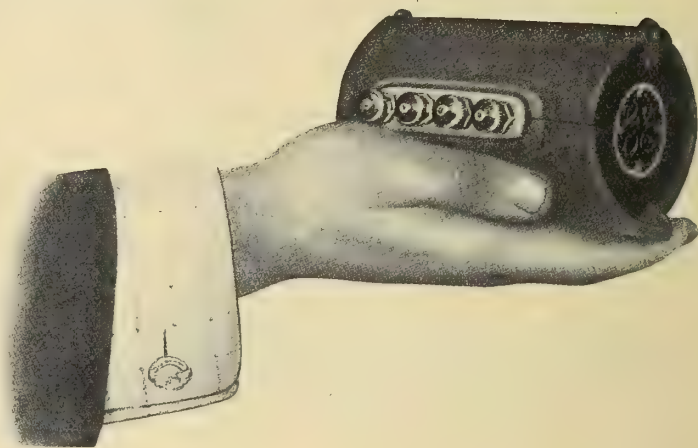
Write us for particulars whether you happen to be in the market just now or not : : : : :

Canadian Representative :  
**Geo. C. Royce**  
West Toronto

# Canadian General Electric Co., Limited

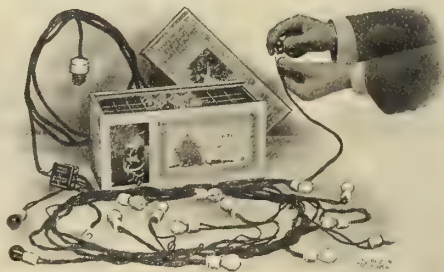
## Bell Ringing Transformers

This new device takes power from the ordinary alternating current House Lighting Circuit, giving secondary voltages of 6, 12 and 18 volts for operating Bells, Buzzers, Door Locks, Burglar Alarm Systems, etc. It is a compact little device, free from mechanical defects and absolutely reliable in operation.



## Electric Decorative Lighting Outfits

for Xmas Trees, Dinner Tables, Conservatories, Parlors and Halls



Charming effects can be obtained by the use of these Outfits and with very little trouble. Can be installed by anyone at once by attaching to the ordinary lamp socket. Its **safety** alone places this outfit in a field by itself.

No Flame—No Odor

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# Xmas Suggestions

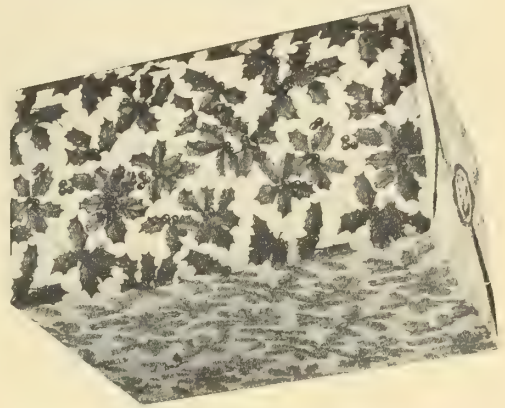
Practical, Attractive and Inexpensive

## Heating Goods

wrapped in appropriate Holly paper

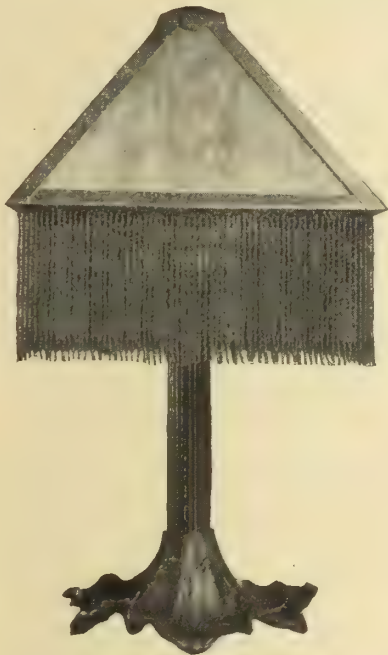
Flat Irons, Coffee Percolators, Tea Kettles, Toasters, Chafing Dishes, Water Heaters, Shaving Mugs, etc.

Any one of the above devices put up in this shape makes an exceedingly tasty Christmas Gift. They are all Simple, Durable and Useful.



6 lb. Flat Iron in Holly Paper Wrapper

## Electric Portables



Cat. No. 9537



Cat No. 7610



Cat No 9539

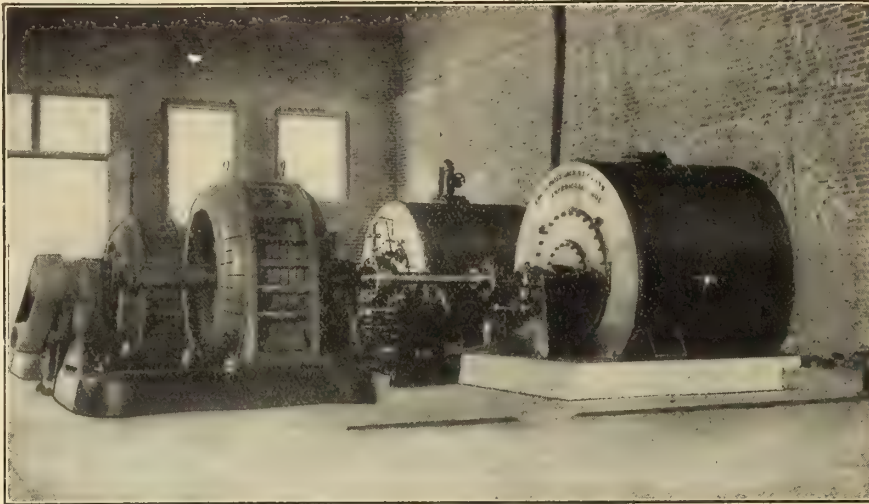
Wired complete ready for attaching to socket. Other neat and moderately priced designs are illustrated in our Catalogue, **section five, second edition.**

# Canadian General Electric Co.

Head Office: TORONTO

Limited

District Offices: Montreal, Halifax, Ottawa, Winnipeg, Vancouver, Rossland



2-Pairs 21" Cylinder Gate Improved Turbines direct connected to Electric Generators

Specifications from consulting engineers are invited and catalogue will be sent to any address on request.

# Turbine Water Wheels

¶ Our Improved Turbine is perfectly adapted for Hydro-Electric installations.

¶ We build it in various styles of setting in all sizes and for heads up to 150 feet.

¶ We also design special settings to suit special conditions.

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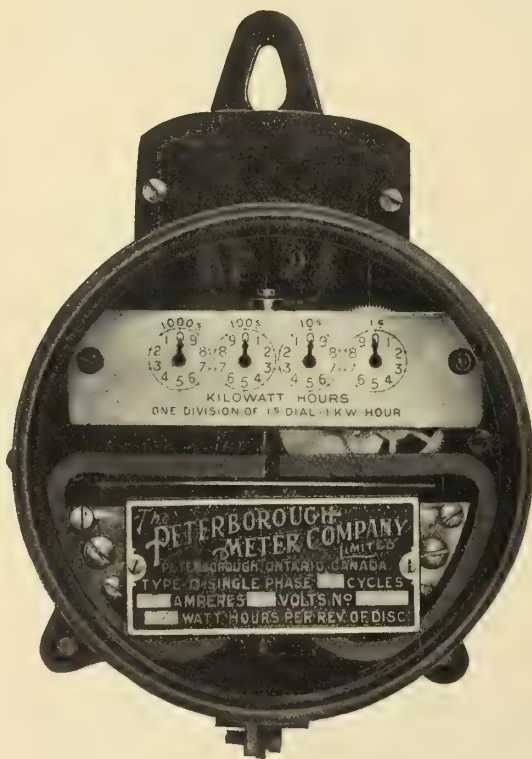
General Offices: Sherbrooke, Que.

Works: Sherbrooke, Quebec

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8 Sales Offices: Sherbrooke St. Catharines Cobalt Rossland Vancouver Montreal

Please address enquiries to nearest sales office



CAN SHIP IMMEDIATELY

## Peterborough Integrating Wattmeter

For Alternating Current

Dust, insect and moisture proof.

Is correct on all loads from two per cent. of its capacity to fifty per cent. overload.

Will run continuously and accurately on fifty per cent overload.

Has no complicated parts, and the friction is reduced to a minimum.

Write for Prices and Bulletin "B"

Sole Selling Agent

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Electrical Supplies

248-250 Craig Street West, Montreal, Que.



# Canadian Electrical News & Engineering Journal

PUBLISHED ON THE FIRST OF EVERY MONTH BY  
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## EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal.

Vol. 18 Toronto, December, 1909 No. 12

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## Universal Electric Power

"We are just entering a new era in the use of power—of universally applied electric power. The fundamental conditions are auspicious, the possibilities are unlimited, and the outcome will be determined very largely by the ability with which electrical men meet the opportunities that lie before them."

This is the view taken by Mr. Chas. F. Scott in an article, published in the November "Electric Journal," in which he discusses, in an exhaustive way, the various fields for electric service, the best methods of applying electric energy effectively, and the relative cost as compared with other forms of energy.

There is much in this sentence that the average electrical man might well ponder. Is it not true that we ourselves are much inclined to look on electricity in many of its newer applications rather from an æsthetic than a practical point of view? Are we not inclined to divide electrical applications into two classes—one, for example, electric railways, being useful and practicable, the other, for example home devices, being chiefly ornamental, and therefore impracticable?

Do we not forget that to-day's commonplaces in electricity were, a quarter of a century ago, the wildest dreams? Do we not fail to look one or two decades into the future for the solution of what seems impossible to us at the present moment?

Does any thinking man hesitate to prophesy at least as great an advance in electrical science, in the next quarter century as in the last 25 years? Is it likely that our most vivid imaginings can form any true picture of electrical conditions in the near future when we look back and consider how far the most sanguine expectations of the past have fallen short of the actuality?

Shall we not, then, take heart and give evidence to the unelectrical world of the faith that is in us? Let us speak of modern applications, not as likely, but as certain to become general. Let us advocate, in season and out of season, the advantage, the practicability, the ideality of electricity as a substitute for every known form of energy; for in spite of our most vivid pictures and in spite of our highest hopes, the man of a few years hence will surely look back with compassion and wonder at the primitive state of our machinery of to-day.

## Competition in Telephone Operating

The idea is apparently gaining ground in certain sections that duplication of telephones is a condition of affairs greatly to be desired. It is claimed by the Independent telephone interests that those cities and municipalities where competition has existed for some years are supplied with a better service than before existed or than where the field is occupied by only one company. For example, Stockholm is represented as being the only properly telephoned city on the whole continent, as a result of being the only city where active competition obtains. There are, however, always two sides to a question, and it is only right to consider that the last ten years have been very growing times, in America especially, and that the telephone business would almost certainly have shown enormous expansion under any conditions. In Toronto, without competition, the last decade, according to the Bell's latest figures, has seen the number of telephones quadrupled. It is also interesting to note the attitude of a writer in a recent issue of the London "Times" who ascribes the restricted development of the telephone system in England to political interference and ascribes the rapid extension of this



utility in the United States to entire freedom from such interference rather than to any other cause.

We are pleased, however, to be able to give our readers the benefit of an article from the pen of the new Independent secretary, who, while presenting his own side of the case, of course, deals with actual statistics in a most interesting manner and presents a fund of information that will prove most useful to every telephone user. His arguments are especially effective in his treatment of the rural service and requirements.

## Regulation of Long Distance Lines

The present day application of long distance transmission, with insistent demands for yet longer distances, is almost daily bringing out new ideas on the regulation and calculation of the high voltage line. A recent paper, on the topic, prepared by Mr. P. H. Thomas and read before the American Institute of Electrical Engineers, has provoked much favorable comment and some criticism, all of which are published in the November proceedings of that society. Among those taking prominent part in the discussion were Prof. T. R. Rosebrugh, of Toronto University, who submitted a simple formula, hitherto unpublished, for calculating lines; Dr. Charles P. Steinmetz, who discussed favorably Mr. Thomas' use of the terms "leading and lagging power"; Mr. Ralph D. Mershon, who spoke on the behavior of synchronous motors used at the end of the line to regulate the power factor of the line; and Prof. Dalemont, of McGill, who called attention to a very simple method where the capacity effects were not negligible and where they are to be considered as evenly distributed along the line.

In this connection we call attention to an interesting article in the present issue of the "Electrical News," in which Mr. Soper outlines a new and original method of calculating transmission lines. Mr. Soper's method involves the use of tables which he has compiled for various percentages of power factors for both copper and aluminum conductors. The ease with which the answers to certain examples are obtained indicates that to the claim of originality can justly be added that of extreme rapidity and simplicity.

## Storage Batteries for Peak Loads

The tendency nowadays with all concerns using power of any kind is in the direction of equalizing the load on the generators by the employment of some auxiliary storage device. For example, the flywheel formed one of the earliest and simplest methods of taking up shocks, and the modern development of this idea is in the form of various systems of flywheel energy storage. The advantage of such a device is that power can be produced at a lower cost per unit owing to the fact that main generators are working always at full speed or thereabouts.

The form of stored energy that has come to be recognized in recent years as possessing the greatest possibilities is the electric storage battery. This is especially true where the changes in load are not very rapid and where the increase or decrease may persist for some time. Such a condition is probably best represented by the ordinary traction system where the storage battery has come to be looked upon as part of the necessary initial installation, unless, indeed, it may be on the very largest systems where the peaks can generally be depended upon to counterbalance one another.

The current number of "The Electrician" publishes a description of the different methods of regulating fluctuating loads, as practiced on the Continent. The value of a controlling booster battery is shown and diagram-

matic explanations are given of some half-dozen different types of booster installations. We are fortunate in having anticipated this discussion insofar as to be able to submit simultaneously an article on the same subject from the Canadian point of view by Mr. E. B. Walker. Mr. Walker has had as valuable and varied an experience in this department of engineering as probably any man in Canada, and we believe speaks with the highest authority.

## Damage by Electrolysis

Ten of the largest European cities have submitted, on request, to the United States Bureau of Manufacturers, the following answers to certain questions dealing with electrolytic damage to pipes and other metallic structures, the questions submitted being as follows:

1. Are track rails used for return circuit of street railway lines?
2. What is the permissible drop in potential over the return circuits of railway lines?
3. What is the maximum difference of potential between track rails used as return circuits and any metallic substructures contiguous to the rails?
4. What are the regulations or practices with reference to electrically connecting track rails to metallic substructures?

In the light of recent trouble in a number of Canadian cities the answers to these questions furnish much interesting information. An affirmative reply is given in every case to the first question. The answers to questions 2 and 3, with the names of the cities consulted, are given below in tabulated form. Question 4 elicited the infor-

City.	Permissible drop in potential over street railway return circuits.	Potential difference between track rails and contiguous pipes.
London .....	7 volts, maximum drop.....	Pipes, + 1.4 volts; pipes, -4.2 volts.
Paris .....	1 volt per kilometer; 5 volts maximum	Average of 1 volt normal operation.
Berlin.....	No specific regulation.....	No specific regulation .....
Vienna.....	5 to 7 volts at maximum traffic	Maximum observed, 1 volt.
St. Petersburg..	1.5 volts maximum in city; 3 volts maximum in suburbs	No regulation.....
Moscow.....	Maximum 1.5 volts in city; 3 volts in country.	....do.....
Glasgow.....	7 volts, maximum drop.....	Maximum observed, less than 1 volt.
Liverpool.....	....do .....	Maximum, 4.5 volts.....
Brussels.....	No specific regulation.....	No specific regulation .....
Christiania....	Maximum drop about 10 volts	Maximum, about 5 volts.....

mation that, of eight cities answering the question, the practice of bonding the rails with gas, water or other metal substructures, was only practiced in one, London, and then under special regulation. It may reasonably be assumed that the two cities that failed to submit an answer to this question would have answered had they possessed any information on that point. On this supposition it is plain that the practice of bonding track rails to other metallic systems does not find favor in Europe.

We note with regret the death of Mr. Arthur H. Edwards, general purchasing agent for the Montreal Light, Heat & Power Company. Mr. Harry O. Edwards, of the Canadian General Electric Company, of Toronto, is a brother.



## QUESTIONS AND ANSWERS

### GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.

Q.—Please inform me of the nature of the current in the secondary coil of an induction coil when an unbalancing, direct current is used in the primary coil.

A.—The e.m.f. generated in the secondary coil produces an alternating current if a circuit is provided.

Q.—Can two constant-current regulators for series arc circuits be connected to a three-phase system by means of the Scott or T-connection? If so, will a slight unbalancing of the arc circuits cause serious trouble?

A.—The T-connection of two transformers can conveniently be used for obtaining energy on a three-phase system for use in two arc-lamp circuits. The effect of any unbalance in the separate circuits will be exactly the same as though these two circuits were connected to the two separate phases of a two-phase generator. Any slight unbalance will not be noticeable on the generator or transmission system, while the operation of each arc circuit will not be affected in any way by any change in the other arc circuit.

Q.—Can a two-phase induction motor be run from two single-phase transformers supplied with energy from a single-phase primary circuit?

A.—The transformers have no effect with reference to the change in the time phase of the voltage, although they may change the value of the voltage. That is to say, the effect is the same whether the transformers are used or not used. A two-phase induction motor may be started from a single-phase circuit by connecting in series with one winding a certain amount of resistance, the two windings being connected in parallel across the supply system. When started in this way the machine is spoken of as a split-phase motor. When approximately full speed has been reached, the circuit containing the resistance is opened and the machine operates as a single-phase induction motor. It is not possible to operate a two-phase induction motor as a two-phase machine from a single-phase supply system.

Q.—Can the damaged armature of an exciter be tested with energy from the alternating current mains? If so, how may a burn-out or short circuit be found by this means?

A.—In testing for a burn-out, run two leads from the alternating current mains and place an incandescent lamp in series with one of them. When the leads are applied to opposite points of the commutator, the lamp will usually give a diminished candle power owing to the choking effect of the armature winding. If on touching the wires to the commutator at points 90 degrees apart the light becomes dimmer, it would indicate that the burn-out is within the 90 degree section between the wires. When the wires are on the adjacent bars of the open coil there will be only one path for the circuit, and that is through the rest of the armature, the choking effect of which will be sufficient to cause the lamp to burn with only a very dull red color. When testing for

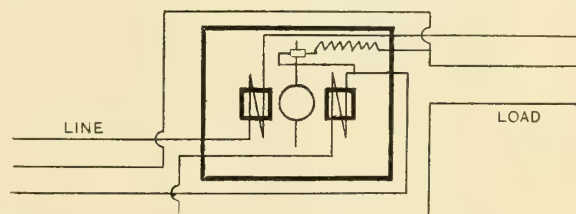
a short circuit between adjacent bars, a bank of lamps should be employed so that when the test wires are applied to two adjacent bars between which no fault exists, the lamps will give about one-half normal candle power. On touching the pair which is short circuited, the lamps will burn with full brilliancy.

Q.—What are the relative advantages of a single three-phase transformer and three single-phase transformers?

A.—In general, the three-phase transformer has the electrical advantages of three single-phase transformers. The three-phase transformer, however, is not ordinarily used in preference to three single-phase transformers because of the financial question involved in carrying a stock of these transformers, especially with smaller companies, and the inflexibility of the transformer compared to three single-phase transformers in emergencies. Where three single-phase transformers are connected in delta for three-phase service and a short circuit develops on one phase or one transformer is in any way damaged, one transformer may be cut out and the service continued by the other two transformers at slightly reduced output. A three-phase transformer under certain conditions could not be thus operated, and service would have to be discontinued until a new transformer was installed. Accidents of this kind, however, are not as prevalent as heretofore. It is general practice to feed lighting loads from single-phase circuits regardless of whether the generated power is two-phase or three-phase. The commercial advantages of having single-phase transformers available for such service as well as for motor service with a minimum outlay for stock are apparent.

Q.—Kindly explain how an electric meter may be connected up so as to read inaccurately.

The sketch below will explain how a meter can be wrongly connected, so that it will run forward, stand still



or run backward. Supposing the meter were connected on a 220 volt, three wire system; you will find by turning on two lights on one leg that the meter will register correctly; and when two additional lights are turned on on the opposite leg, the meter will stop registering. When additional lights are turned on in the leg which is wrongly connected, the meter will run backward.

Q.—How can I arrange a bi-polar generator so as to be able to obtain direct current as before, and, in addition, alternating current?

A.—On the end opposite the commutator mount collector rings for the alternating current circuit. If single-phase alternating currents are wanted, use two collector rings; tap one into any coil and note to which commutator segments that coil is connected. Tap the other collector ring into the coil connected to the commutator segment diametrically opposite that connected to the first ring. If two-phase currents are required, add two more collector rings and connect them with coils connected to segments at right angles to those already used. If three-phase currents are wanted, use three collector rings and connect them respectively to coils connected to commutator segments 120 degrees apart upon the machine.



# Dominion Power & Transmission Company

**A Pioneer Company well abreast of the Times—Rapid Railway Extension—New Outdoor Switching Station—A very Large Enterprise**

Two facts stand out prominently in the consideration of the Dominion Power & Transmission Company—the clever conception of the possibilities of developing great power at a point entirely isolated from water supply, and the ease with which the idea, once conceived, was put into effect. There were no expensive dams to be built (and rebuilt)—nature had seen to that; no reservoirs to be constructed, to provide a constant supply of water—the greatest reservoir supplying any power plant in the world was ready to hand—Lake Erie; no rocky precipices to blast and tunnel through to make way for penstocks or power house, but down a gentle natural decline the huge pipes lie exposed from end to end, straight as an arrow; no tail race to construct to carry off the water, for 12-Mile Creek flows graciously beneath, carrying the spent water by a slow and winding course to join its friends again in Lake Ontario.

In 1898 the Hamilton Cataract & Power Company, the parent of the present system, had obtained from the Dominion Government permission to withdraw from the Welland canal water at the rate of 100 cubic feet per second, and had constructed at DeCew Falls a power plant capable of developing about 9,000 h.p. Six years later, in December, 1902, application having again been made to Parliament, permission was granted to the company to withdraw from the canal an additional 600 cubic feet per second, or sufficient altogether to develop well up to 65,000 h.p. Of this, up to the present moment, somewhere in the neighborhood of 40,000 h.p. is in use. The lease of this amount of power runs for 20 years from the 1st of January, 1903, with the privilege of renewal on the company's part for two like periods. In other words, the lease extends to 1965. The company, by the terms of the lease, pays to the Government the nominal sum of \$1 per year for h.p., this amount being subject to readjustment at the end of each renewal period.

## The Water Supply

The difference in altitude between Lake Ontario and Lake Erie is 325 feet. This drop is, in general, distributed over a considerable distance, as, for example, along the Niagara river, but at the point chosen by the Dominion Power & Transmission Company for their development plant there is a sudden fall in less than 1,000 feet of more than three quarters of the total difference of level between the lakes. The problem this company set itself to solve was how to lead considerable quantities of water to the crest of this precipice. Careful surveys finally disclosed the fact that the elevated area of land lying between the selected point and the Welland canal was a sort of shallow water basin, a natural storage area, a few feet lower than Lake Erie. A canal three-quarters of a mile in length would be sufficient to connect the Welland canal at the Erie level with this water basin. This canal was built, with the result that nearly 500 acres of low land were transformed into a quiescent inland lake stretching almost to the brow of the hill (fig. 1). Lying within a few feet of the crest of the hill was another and smaller basin, some 30 acres in extent. The two basins were connected by a second canal 1,000 feet long, and as a result, a total area of over 500 acres of level water, of unerring supply and unvarying quantity stood ready on the removal of a few feet of embank-

ment to pour themselves a distance of 270 feet into the valley beneath.

## The Power Development

The water is led directly from the 30-acre lake or forebay mentioned above, down the hillside by five large metal penstocks 940 feet long. The water head development is 254 feet. Four of these penstocks discharge themselves respectively, within the power house, against 4 Voith type, spiral, double discharge, 6,100 h.p. turbine

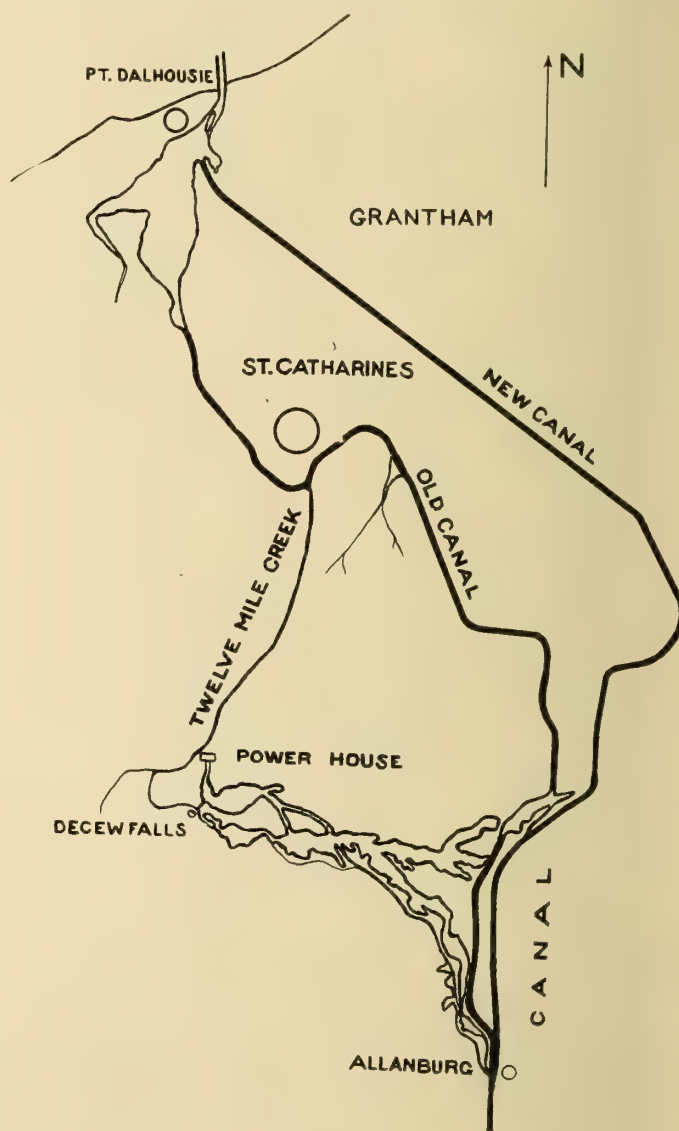


Fig. 1.

wheels (fig. 2 shows one of these turbines in cross-section). This group represents the addition to the water power installed in 1904-5. The fifth and larger penstock, representing the original installation of 1898, provides the motive power for four smaller turbines, two of 3,000 h.p., two of 1,500 h.p. capacity, and for two small turbine driven excitors.

The four new turbines are provided with servo-motor hydraulic governors which automatically control the supply of water to the wheels. They are also provided with



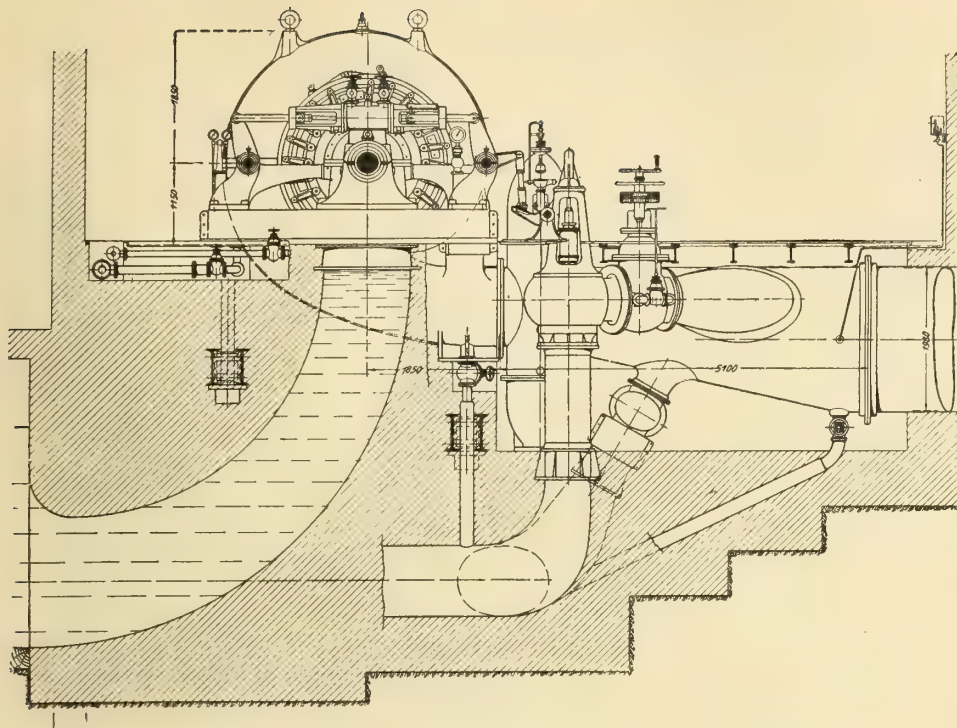


Fig. 2.—Voith Type Turbine.

draft tubes which carry off the discharged water and add another eleven feet of pressure, making the total head 265 feet. The original generators comprised two 2,000 k.w., 286 r.p.m., 28 pole, 66 $\frac{2}{3}$  cycle dynamos (Canadian General Electric), and two 1,000 k.w., 400 r.p.m. dynamos (Royal Electric Company). The two exciters are each direct coupled 30 k.w. Crocker Wheeler type 1,000 r.p.m., 70 volt, 425 amperes. The newer electrical installation consists of two 6,400 k.w. and two 5,000 k.w. generators, 286 r.p.m., 28 poles, 66 $\frac{2}{3}$  cycles (Canadian Westinghouse). These are direct connected to the turbines. All current is generated at 2,400 volts. Thus a

steady load of 28,800 k.w. can be carried, which is capable, at peak, of increase up to 36,000 k.w.

Provision has been made for the installation of two more generating units of 6,100 h.p. capacity each, for which the water supply is already ample. These can now be added at a fraction of the outlay required for the former installation.

The location of all the generating stations of the system is shown in fig. 3, and their respective capacities are given in the lower right hand corner of this figure. It is shown here that in addition to the main power house at DeCew Falls, the company has a number of smaller auxiliary generating stations—two steam plants at Hamilton and Brantford of 2,800 and 300 k.w. respectively, and two hydraulic plants at Brantford and St. Catharines of 600 and 200 k.w., making a total generating capacity for the system of 32,700 k.w.

Step-up transformation is carried on in three groups, each group of transformers taking current from the dynamos at 2,400 volts and raising it, according to the distance over which it is to be transmitted, to either 10,000 volts, 20,000 volts, or 45,000 volts.

## Transmission and Transforming Stations

The high tension current leaves DeCew Falls in five different directions. One line feeds St. Catharines at a 10,000 volt pressure, which is cut down to 2,400 volts for city distribution. A second line, also 10,000 volts, reaches out to Thorold, where the Dominion Govern-

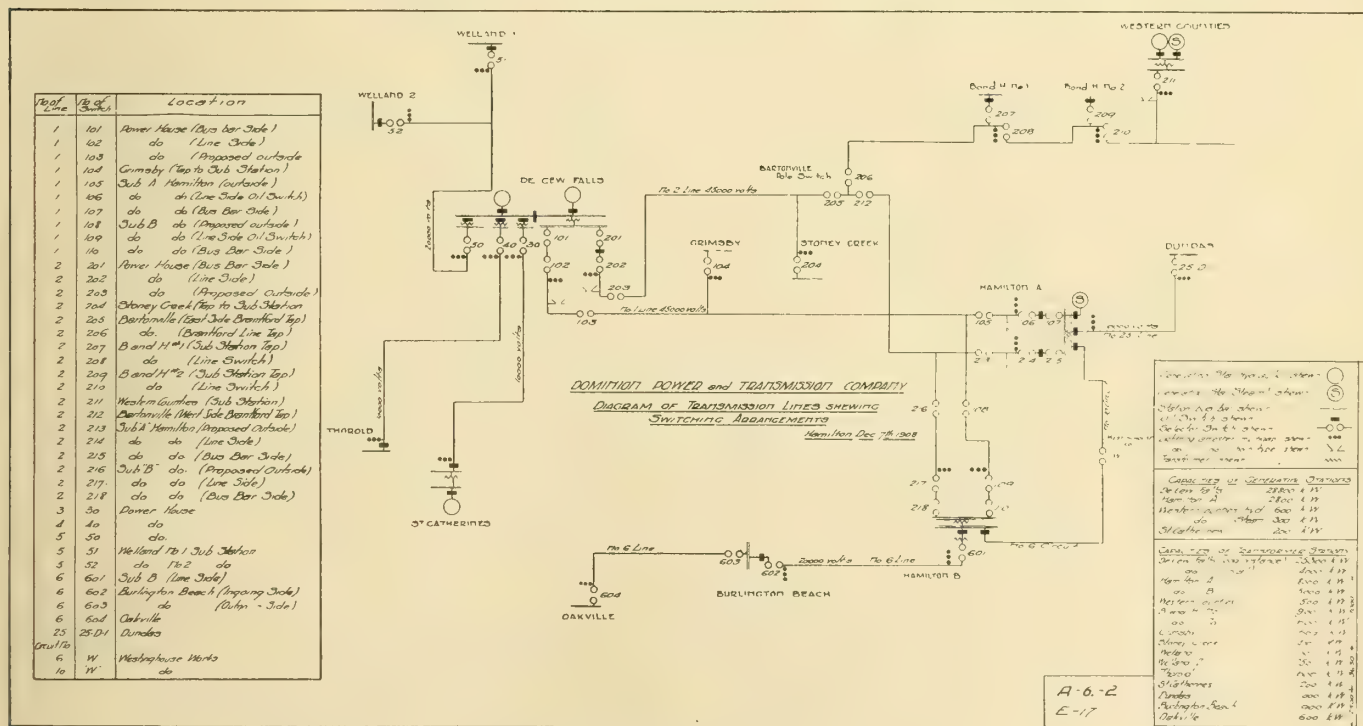


Fig. 3.—Transmission Lines.





is, with the axis of the pin vertical instead of horizontal, as is the general practice for outdoor disconnecting switches. This will give best insulating results in wet weather

### The Railway System

One of the finest terminal stations in the Dominion, located in Hamilton, is the centre from which all the different railway lines of this company may be said to radiate. This building, by the way, is also the executive centre and head of the Dominion Power & Transmission Company and all its subsidiaries. These railways, representing a total of 95.64 miles of single track, are calculated to furnish with up-to-date transportation facilities a population, largely rural, of about 200,000 people. The various lines and their exact positions are shown in fig. 6, where projected extensions are also indicated in dotted lines.

The total system is made up of five smaller units, as follows: the Hamilton Street Railway, 22 miles of single track; the Hamilton & Dundas Railway, connecting the two cities, 6.98 miles; the Hamilton Radial Railway, connecting Hamilton with Burlington via Burlington beach and extending through Bronte to Oakville, a distance of 21.46 miles, partly double tracked; the Hamilton, Grimsby & Beamsville Railway, passing through

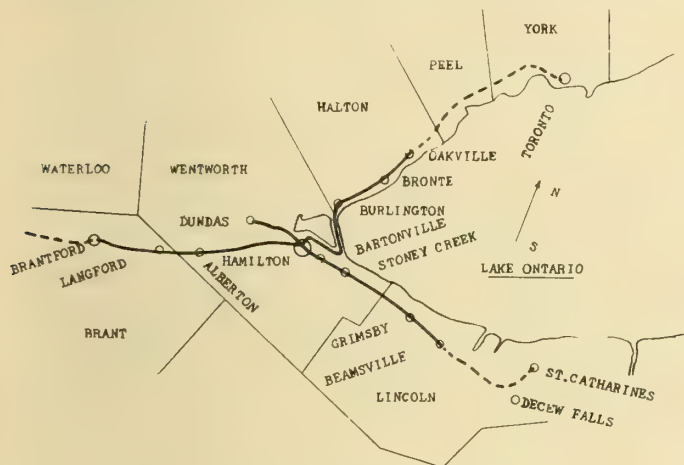


Fig. 6.—Railway Systems.

Bartonville and Stoney Creek and terminating at Beamsville, 22.29 miles; and the Brantford & Hamilton Railway, which takes in the principal towns of Ancaster, Alberton, Langford and Cainsville, 22.91 miles. In the near future it is proposed to extend the Beamsville line to St. Catharines, the Oakville line to Toronto, and the Brantford line west, probably to Windsor. The inter-urban lines are located for the most part on private right of way, or to be exact, on 54.09 out of 73.64 miles.

### The Company as it Stands To-day

In addition to the electric railway system already described, this company controls the following light and power companies: Dundas Electric Company, Hamilton Electric Light & Power Company, Lincoln Electric Light & Power Company, Western Counties Electric Company, Brantford Electric & Operating Company, Hamilton Terminal Company, Welland Electric Company.

The consolidation of these companies took place something over two years ago as a result of necessary increase in the financial capacity of the Hamilton Cataract Power, Light & Traction Company, on which date the latter company ceased to exist. The total assets of the consolidated system is placed in the last general statement at \$18,637,000. The liabilities chiefly outstanding against

this amount comprise bonds to the extent of \$6,511,000, preferred stock, \$3,668,100; limited preference, \$4,863,900; common stock, \$2,686,700. The net earnings for 1908 amounted to \$1,600,312, of which operating expenses absorbed 61 per cent., or \$974,641, leaving \$625,671. The bond interest took \$323,047 more, leaving only \$302,624, so that little as yet is left for the ordinary after the preference requirements have been satisfied.

The president of the company, since the retirement of Hon. J. M. Gibson, is Mr. J. R. Moodie, with James Dixon, Esq., as vice-president. The directors include such well known names as J. W. Sutherland, Andrew Cooke, John Knox, S. O. Greening, Lloyd Harris, Wm. Southam and Wm. C. Hawkins. Mr. Hawkins is also secretary and general manager, with Mr. W. G. Angus as assistant to the general manager and as electrical engineer. The important duties of power house superintendent are performed by Mr. F. W. Throop, and the railway department is under the able management of Mr. E. P. Coleman. J. G. Gibson is superintendent of suburban lines and D. N. Miller of the Hamilton City section.

### Outstanding Features

The water power development of the company is one of the most economical and valuable hydraulic plants in America, and there should be no question but that energy can be delivered by this company at a price to compete with any opposition that may arise, at least in the immediate future, i.e., under present known conditions of hydraulic and electrical engineering. It will also prove an item of great financial advantage, which must benefit the producer and consumer alike, that the present developing plant can be increased by from 30 to 35 per cent. at a much smaller cost relatively than the past installations have demanded. This extension, too, will entail little or no extra cost of operation.

The point of vantage, however, which the company itself always takes occasion to emphasize and which, in view of difficulties that other developing companies have met from time to time, is claimed to be of considerable importance to the consumer, is that this plant has never in its history and never can suffer any delay or inconvenience from an ice blockade, the nature of its water supply being a level currentless lake, which freezes over early and remains so until late in the spring.

In point of size it is believed that the assets of this company stand second to only one other Canadian company of all the electrical operating systems in the Dominion.

### American Society of Mechanical Engineers

The 30th annual meeting of this society will be held in the Engineering Societies Building, 29 West 39th Street, New York, December 7 to 10.

The following papers will be presented: "Tests on a Venturi Meter for Boiler Feed," Chas. M. Allen; "The Pitot Tube as a Steam Meter," Geo. F. Gebhardt; "Efficiency Tests of Steam Nozzles," F. H. Sibley and T. S. Kemble; "An Electric Gas Meter," C. C. Thomas; "Tan Bark as a Boiler Fuel," David M. Myers; "Cooling Towers for Steam and Gas Power Plants," J. R. Bibbins; "Some Studies in Rolling Mill Engines," W. P. Caine; "An Experience with Leaky Vertical Fire Tube Boilers and the Best Form of Longitudinal Joint for Boilers," F. W. Dean; "Testing Suction Gas Producers with a Koorting Ejector," C. M. Garland and A. P. Kratz; "Bituminous Gas Producer," J. R. Bibbins; "The Bucyrus Locomotive Pile Driver," Walter Ferris; "Line Shaft Efficiency, Mechanical and Economic," Henry Hess; "Pump Valves and Valve Areas and a Report on Cast Iron Test Bars," A. F. Nagle.



# The Calculation of Transmission Lines

**A new Method by the use of Tables—No Difficult Mathematical Calculations—The Tables Explained—Numerous Examples Worked Out**

By A. J. SOPER

Recently several papers have been published on the predetermination of the regulation and energy loss in transmission lines. The methods or formulæ given for the calculation of these quantities require considerable work when applied, and in some cases are so complex as to necessitate careful study before they can be used. The method described in this paper is accurate in the solution of many problems in the transmission of electric energy and its application requires but a small amount of work.

The regulation or voltage drop in a transmission line depends on the following six factors, each of which must be known or assumed before the regulation can be calculated, viz.: 1, resistance; 2, inductance; 3, capacity; 4, frequency; 5, current; 6, power factor of load.

In general, the capacity effect is small and can be neglected as it improves the regulation of the circuit. However, in the case of long lines operating at high voltages it plays an important part, so that for such conditions the use of the method given in this paper does not give accurate results.

The relationship of the different e.m.f.'s in a single phase transmission circuit is best represented by vector diagrams, such as are given in figs. 1 and 2. Fig. 1 shows the conditions when power is supplied to a non-inductive load, and fig. 2 when power is supplied to a load having a lagging power factor, which is the condition usually met with in practice.

In the diagrams, the different quantities are represented as follows:

$IR$  = Resistance drop.

$IX$  = Reactance drop.

$E$  = Receiver voltage.

$E_0$  = Voltage at generating end of line.

$\phi$  = Angle of lag in the load.

$OD$  = Energy component of the receiver voltage in phase with the current.

$DA$  = Wattless component of the receiver voltage in quadrature with the current.

The voltage regulation of the circuit is the increase in the value of  $E_0$  over  $E$ , which is usually expressed

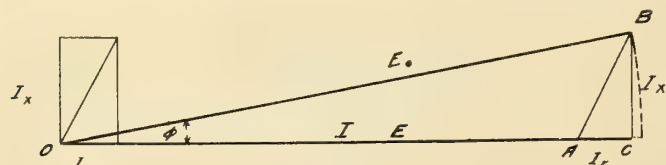


Fig. 1.

as a percentage of  $E$ , the receiver voltage as  $E_0 - E$

$$\frac{E_0 - E}{E} \times 100 = \text{percentage regulation.}$$

Considering the diagram, we see that the regulation voltage of any line is obtained by rotating the line  $E_0$  until it comes in line with  $E$ , giving  $AE$  the difference between  $E$  and  $E_0$  as the regulation voltage of the circuit. The value of  $AE$  is proportional to  $IR$  and  $IX$ , so that the regulation voltage of a line with definite frequency, spacing between conductors and power factor of load can be expressed in terms of the regulation voltage per ampere per mile of line as illustrated in fig. 3. This method is used in the convenient chart for the calculation

of transmission lines recently published by Prof. L. A. Herdt, in "Electrical World."

The relation between the resistance and reactance volts per ampere per mile of single phase line for conductors, located different distances apart, is illustrated by the curves given in fig. 4. The regulation volts per ampere per mile of line of any size of wire for definite frequency, spacing between conductors and power factor of load can be obtained by choosing an example and calculating the total regulation voltage of the circuit from the formula  $E_0 = \sqrt{(E \cos \phi + IR)^2 + (E \sin \phi + IX)^2}$ .

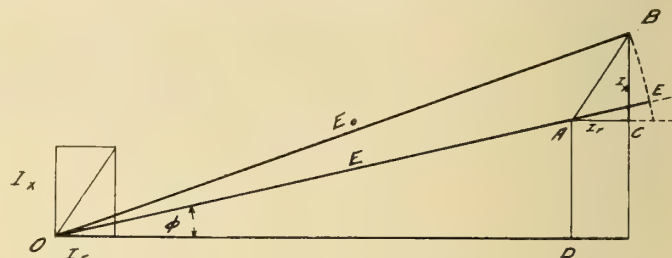


Fig. 2.

Then  $E_0 - E$  divided by the length of the line in miles and by the current will give the regulation volts per ampere per mile of line for the conductor used in the calculation.

For conditions usually met with in practice such as 80 per cent. power factor of load and frequencies of 60 cycles or less, the regulation voltage of any size of wire for fixed spacing can be determined with sufficient accuracy by use of the formula: Regulation volts per ampere per mile of line =  $R \cos \phi + X \sin \phi$  where  $R$  = the resistance of the conductor per mile of line,  $X$  = the reactance per mile of line (2 wires) and  $\phi$  = the angle of lag in the load. The use of this formula involves a slight error as the calculated value is equivalent to the use of the chord  $BE$  in place of the arc, in fig. 2.

This error is very small at a power factor such as 80 per cent. and frequencies of 60 cycles or less, so that the use of the formula will give results as accurate as the method given above for which an example is chosen, if the slide rule is used to shorten the work. For lagging power factors near unity, unity power factor of load or leading power factors, the first method should be used to determine accurately the regulation volts per ampere per mile of line for different conductors.

The usual problem presented to the engineer for solution is as follows: What size of wire is required to deliver an amount of power, usually expressed in h.p., to some place at a definite distance from the generating or distributing station, with a fixed percentage regulation; and what will be the energy loss in the circuit assuming some power factor of load. Example: 5,000 h.p. to be delivered 80 miles with 10 per cent. regulation power factor of load = 80 per cent.

The method given herein, for making such calculations, which was first brought out in a paper on "Transmission Line Characteristics and Calculations," delivered before the Toronto branch of the A.I.E.E., involves the use of tables. To use the tables, it is only necessary to multiply the number of hundreds of horse



power to be transmitted by the distance in miles, then, using the value obtained as a constant, note in the table given under the voltage of the transmission circuit, the constant which corresponds to it, or has the nearest greater numerical value, and opposite to the same will be found the size of wire required. The tables given for illustration apply to three-phase circuits with copper conductors delivering power at 80 per cent. power factor and frequencies of 60 and 25 cycles. Standard voltages and spacings have been chosen and the constants in the tables obtained as follows:

Calculate the regulation volts per ampere per mile of line for each size of wire at the different spacings and at frequencies of 25 and 60 cycles. This regulation voltage per ampere per mile of line multiplied by some value of current will give the total permissible regulation voltage for a circuit one mile in length. A three wire, three-phase transmission circuit of which the conductors are symmetrically related may, so far as energy loss and line drop are concerned, be replaced by two single-phase circuits having no inductive interaction and identical with the three-phase line as to size of wire and spacing between conductors. To calculate a three-phase circuit, obtain the size of conductors required in a single-phase circuit to carry one-half the load at the same voltage. If we multiply the equivalent single-phase current for 100 h.p., three-phase by the regulation volts per ampere per mile of line and by K, an unknown, then equate this expression to the value for the permissible regulation voltage of the circuit and solve for K, we obtain a constant for the size of wire at the transmission voltage used in the calculation. Example:

Receiver voltage .....	40,000
Regulation voltage (10 per cent)...	4,000

Equivalent single phase current for 100 h.p. three-phase delivered at 40,000 volts 80 per cent. power factor = 1.167 amperes. Then  $K = 4,000$  divided by  $1.167 \times$  regulation volts per ampere per mile of line at frequency, spacing and power factor assumed, where  $K = \text{constant}$  for each size of wire.

The power that can be transmitted over a line at a given voltage multiplied by the distance of transmission is a constant for the same percentage voltage regulation and energy loss, for example, if the power be doubled, the

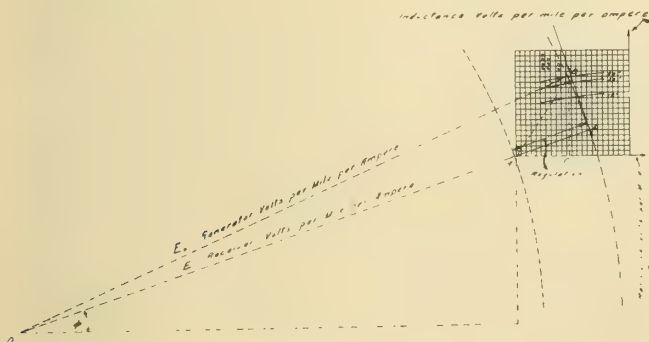


Fig. 3.

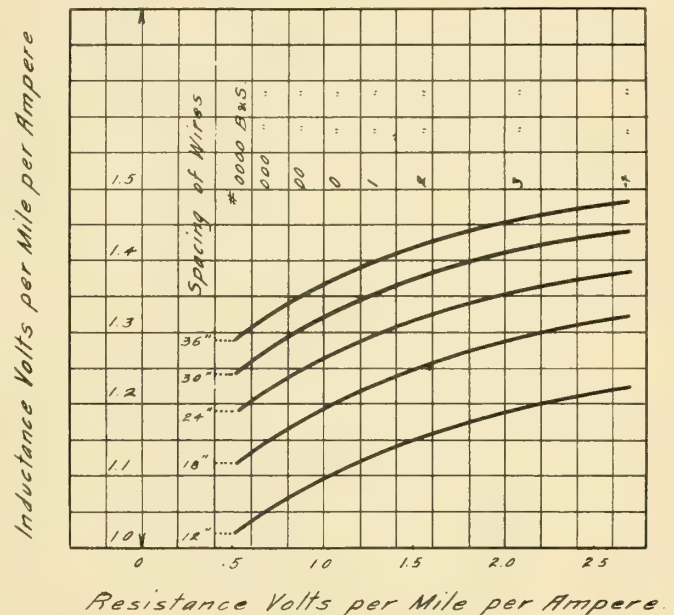
distance of transmission must be divided by two in order to obtain the same regulation and energy loss.

The energy loss tables are based on 10 per cent. energy loss in the circuit and are obtained by replacing the total regulation volts in the formula by 10 per cent. of the energy component of line voltage and the regulation volts per ampere per mile of line by the resistance volts per ampere per mile of line.

The tables can be used in the solution of any of the following problems:

- The size of wire for a given line drop.
- The size of wire for a given watt loss in the line.
- The line drop and watt loss for given sizes of wires.
- The maximum amount of power that can be transmitted for given sizes of wires with a definite line drop or energy loss.
- The effect on the line drop of frequencies of 25 and 60 cycles.
- The effect on the line drop and energy loss of the power factor of load with given sizes of wires.

The tables are also of value in choosing the voltage



## TRANSMISSION LINE CALCULATION TABLES

## Regulation

Copper Conductors, 60 Cycles, Power Factor=.8

Delivered volts	.....	60,000	50,000	40,000	30,000	20,000	10,000	8,000	6,000	5,000	4,000	3,000	2,000	1,000	
Spacing in inches	.....	72	60	48	32	36	24	18	18	18	18	18	18	18	
Size Wire	Lbs. wt.														
per mile wire															
6	.....	419.5	1770.	1240.	800.0	463.0	201.5	51.25	38.2	18.55	12.9	8.28	4.66	2.07	.518
5	.....	529.0	2108.	1482.	953.0	527.5	241.4	61.35	46.1	22.35	15.6	9.96	5.61	2.49	.622
4	.....	667.4	2495.	1755.	1132.0	642.0	288.0	73.65	55.2	26.7	18.56	11.90	6.72	2.97	.747
3	.....	841.1	2925.	2057.	1333.0	758.0	334.5	86.90	65.3	31.7	22.05	14.1	7.97	3.53	.884
2	.....	1062.0	3245.	2385.	1550.0	923.0	403.5	101.8	76.6	37.2	25.9	16.5	9.34	4.13	1.037
1	.....	1337.0	3895.	2740.	1780.0	1015.0	455.5	117.8	89.2	43.2	30.1	19.25	10.85	4.81	1.205
0	.....	1687.0	4400.	3115.	2030.0	1156.0	520.0	135.2	102.4	49.7	34.6	22.15	12.47	5.53	1.385
00	.....	2127.0	4930.	3495.	2280.0	1303.0	586.5	153.4	116.7	56.7	39.4	25.1	14.4	6.30	1.58
000	.....	2682.0	5430.	3850.	2515.0	1440.0	652.0	170.8	130.5	63.4	44.2	28.2	15.9	7.06	1.765
0000	.....	3381.0	5990.	4260.	2790.0	1604.0	724.0	191.0	146.5	71.3	49.5	31.7	17.9	7.92	1.99
250,000	.....	3996.0	6250.	4490.	2950.0	1685.0	763.0	202.0	155.5	75.03	52.5	33.6	18.9	8.39	2.10
300,000	.....	4785.0	6470.	4625.	3310.0	1745.0	790.0	208.7	161.5	78.2	54.4	34.9	19.65	8.70	2.18
350,000	.....	5585.0	7100.	5225.	3780.0	1930.0	881.0	233.8	179.8	87.2	60.7	38.9	21.9	9.68	2.43

## Regulation

Copper Conductors, 25 Cycles, Power Factor=.8

Delivered volts	.....	60,000	50,000	40,000	30,000	20,000	10,000	8,000	6,000	5,000	4,000	3,000	2,000	1,000	
Spacing in inches	.....	72	60	48	32	36	24	18	18	18	18	18	18	18	
Size Wire	Lbs. wt.														
per mile wire															
6	.....	419.5	2052.	1430.	920.	518.	231.2	58.2	37.4	21.0	14.6	9.33	5.27	2.34	.587
5	.....	529.0	2510.	1754.	1124.	637.	283.0	71.5	45.8	25.80	17.95	11.48	6.47	2.87	.720
4	.....	667.4	3070.	2150.	1379.	781.	347.0	88.5	56.0	31.8	22.1	14.12	7.97	3.53	.886
3	.....	841.4	3720.	2612.	1674.	952.	423.0	107.5	69.2	38.8	27.04	17.3	9.75	4.33	1.085
2	.....	1062.0	4490.	3140.	2032.	1148.	512.0	130.1	83.9	47.2	32.8	21.0	11.83	5.26	1.317
1	.....	1337.0	5370.	3762.	2424.	1377.	615.0	157.0	102.7	56.8	39.6	25.35	14.3	6.34	1.59
0	.....	1687.0	6350.	4465.	2886.	1640.	733.0	187.8	121.6	68.3	47.6	30.4	17.15	7.61	1.91
00	.....	2127.0	7530.	5240.	3398.	1930.	863.0	220.0	144.6	81.2	56.5	36.1	20.4	9.04	2.26
000	.....	2682.0	8590.	6040.	3918.	2230.	1000.0	259.0	168.0	94.3	65.8	42.1	23.7	10.52	2.64
0000	.....	3381.0	9670.	7010.	4560.	2600.	1150.0	303.0	198.4	111.3	77.5	49.7	28.0	12.3	3.11
250,000	.....	3996.0	10690.	7550.	4910.	2796.	1262.0	327.5	215.2	120.8	84.0	53.8	30.4	13.45	3.38
300,000	.....	4785.0	12950.	7860.	5120.	2912.	1313.0	343.0	225.2	126.2	88.0	56.3	31.7	14.1	3.53
350,000	.....	5585.0	13840.	9110.	5960.	3390.	1540.0	403.0	266.0	149.6	104.1	66.7	37.6	16.7	4.18

## Energy Loss

Copper Conductors, Power Factor=.8

Delivered volts	60,000	50,000	40,000	30,000	20,000	10,000	8,000	6,000	5,000	4,000	3,000	2,000	1,000	
Spacing in inches	72	60	48	32	36	24	18	18	18	18	18	18	18	
Size Wire	Lbs. wt.													
per mile wire														
6	419.5	1480.	1030.	661.5	372.0	164.8	41.6	26.3	14.8	10.28	6.62	3.73	1.45	.413
5	529.0	1865.	1295.	832.0	467.5	208.0	52.3	33.2	18.65	12.95	8.32	4.68	1.84	.521
4	667.4	2350.	1638.	1050.0	590.0	262.0	66.1	41.8	23.5	16.35	10.50	5.92	2.32	.657
3	841.1	2970.	2068.	1350.0	746.0	332.0	83.4	52.8	29.7	20.7	13.50	7.48	2.93	.830
2	1062.0	3750.	2610.	1672.0	938.0	417.0	105.1	66.6	37.5	26.1	16.72	9.43	3.70	1.046
1	1337.0	4720.	3287.	2108.0	1184.0	526.0	132.5	84.0	47.2	32.8	21.08	11.88	4.66	1.32
0	1687.0	5960.	4140.	2655.0	1493.0	663.0	167.0	105.8	59.7	41.4	26.50	14.97	5.88	1.663
00	2127.0	7510.	5225.	3345.0	1884.0	837.0	210.7	133.5	75.1	52.2	33.45	18.87	7.40	2.09
000	2682.0	9470.	6580.	4160.0	2372.0	1053.0	265.5	168.1	94.7	65.08	41.60	23.80	9.33	2.64
0000	3381.0	11940.	8310.	5320.0	2993.0	1333.0	335.5	212.0	119.0	83.0	53.20	30.1	11.76	3.33
250,000	3996.0	13500.	9410.	6025.0	3390.0	1504.0	379.0	240.0	135.2	93.8	60.25	33.9	13.3	3.77
300,000	4785.0	16200.	11530.	7230.0	4065.0	1805.0	455.0	288.0	164.0	112.7	72.30	40.8	15.95	4.52
350,000	5585.0	19550.	13600.	8730.0	4915.0	2180.0	549.0	348.0	195.5	136.0	87.30	49.2	19.3	5.47

Note.—The energy loss constants are proportional to the square of the voltage, and also to the area in circular mils.

mile h.p. constant by 0.746. For a single-phase circuit multiply the mile h.p. constant by two.

Similar tables to those given for illustration have been prepared for regulation and energy loss at power factors of 70, 80, 90 and 100 per cent. for both copper and aluminum conductors. In using the tables, care should be taken that the wire which gives the required regulation has the necessary current carrying capacity.

The foregoing is thought to be sufficient to illustrate the use of the tables, but a few examples may be of value

(a) To determine the size of wire for a given line drop or regulation.

Example: To transmit 5,000 h.p. 50 miles, 3-phase, 40,000 volts receiving end, 60 cycles, 80 per cent. power

factor with 10 per cent. regulation. Mile h.p. constant =  $50 \times 50 = 2,500$ . Under the 80 per cent. power factor 60 cycle, 40,000 volt table, we find the constant 2515

opposite No. 000 wire, which is the size to use. The exact regulation will be  $\frac{2500 \times 10}{2515} = 9.94$  per cent.

For a regulation of 8 per cent. the mile h.p. constant =  $\frac{50 \times 50 \times 10}{8} = 3125$ , which gives 300,000 circular mils as

the size of wire to use. The exact regulation will be  $\frac{3125 \times 8}{3310} = 7.55$  per cent.

(b) To find the energy loss for the size of wire to



give 10 per cent. (or any other definite) regulation.

In the energy loss table, 80 per cent. power factor, we find the constant 4160 opposite No. 000 wire. Then

$$\text{energy loss} = \frac{2500 \times 10}{4160} = 6 \text{ per cent.}$$

(c) To determine the size of wire for a given watt loss.

Using the above problem, to find the size of wire for 10 per cent. energy loss. Mile h.p. constant  $= 50 \times 50 = 2500$ . Opposite No. 0 wire in the energy loss table 80 per cent. power factor we find the constant 2655; so this is the size of wire to use. The exact energy loss will be

$$\frac{2500 \times 10}{2655} = 9.42 \text{ per cent.}$$

For an energy loss of 5 per cent. the constant  $= \frac{50 \times 50 \times 10}{5} = 5000$ , which gives No. 0000 as the required size of wire. The exact energy loss in this case will be

$$\frac{5000 \times 5}{5320} = 4.7 \text{ per cent.}$$

(d) To determine the line drop and energy loss for No. 00 wires.

Using the same example, the line drop will be

$$\frac{2500 \times 10}{2280} = 10.97 \text{ per cent., and the energy loss}$$

$$\frac{2500 \times 10}{3345} = 7.47 \text{ per cent.}$$

[In view of the importance of this subject we are pleased to be able to state that Professor Dalemont has in course of preparation for the "Electrical News" an article that will deal with and review in a comparative manner the best methods that have been advanced for calculating lines under different conditions.—Ed.]

## Book Reviews

Direct and Alternating Current Testing, by Frederic Bedell, Ph.D.: D. Van Nostrand & Company, publishers. Price, \$2 net—The matter is presented in the form of a laboratory manual and has been prepared primarily for students. The aim has been to arrange an introductory series of experiments of a comprehensive nature which would lead the student to proceed on his own responsibility to more difficult and original problems. The diagrams are complete, though simple, and constitute an attractive part of the book. As a guide in experimental work engineering students will find this book a valuable reference.

The Dynamo—C. E. Hawkins, M.A., M.I.E.E., etc., and F. Wallis, M.A., M.I.E.E. Fifth edition, revised and enlarged; two volumes: Whittaker & Company, London and New York, publishers. 21s. net—Completeness is the best word to describe this work, which comprises 1110 pages of well written, clear, interesting matter, with 594 illustrations. The latter in themselves would constitute a liberal education on the subject. From the most elementary bit of theory to the most complicated piece of structural work the modern dynamo has been thoroughly explained.

Theoretical Elements of Electrical Engineering, by C. P. Heinmetz, A.M., Ph.D. 3rd edition, revised and enlarged. The McGraw-Hill Book Company, New York, publishers. \$4 net—In two parts, the first dealing with the fundamental principles of both alternating and direct currents; the second part being a series of monographs

of the more important electrical apparatus, both direct and alternating. Treatment of the subject less mathematical than might be expected from this author, and so more valuable to the average reader.

Electricity Explained, by J. Calvin S. Tomkins. Cochrane Publishing Company, New York—A popular treatment of a scientific subject. Can be of no use to the electrician but will be of interest to the layman whose knowledge of the subject is quite limited.

Radiation Light and Illumination, by Charles Proteus Steinmetz, A.M., Ph.D. The McGraw-Hill Book Company, publishers. \$3 net.—A series of eight experimental lectures delivered by Dr. Steinmetz to the senior students in electrical engineering at Union University. This eminent author describes these lectures as "an exposition from the engineering point of view of that knowledge of light and radiation which every educated man should possess, the engineer, as well as the physician or the user of light. Mathematical formalism has been avoided wherever possible and the phenomena have been described in plain language." Splendid illustrations and good form throughout. The work appeals to us as a comprehensive presentation of the subject in the smallest space.

## Recent Publications

**How the Telephone Helps the Farmer**—A splendidly illustrated booklet, issued by the Stromberg-Carlson Company, of Rochester, N.Y., containing suggestions as to the best procedure in the organization of rural companies and outlining a model constitution and by-laws. Also much elementary information is given with regard to telephones and telephone construction.

**Lifting Magnets**—A catalogue, variously and fully illustrated, showing the powerful magnets of the Electric Controller & Manufacturing Company, of Cleveland, Ohio, lifting anything from scrap iron to 18,000 pounds in steel ingots. The power of these magnets is a revelation to one who has not followed the recent advances in this particular line of electrical manufacture.

**Tungstoliers and Tungsten Lamps**—An interesting chart compiled by the Tungstolier Company, of Cleveland, Ohio, containing replies from 100 central stations to 14 questions covering the field of their experience in tungsten lamp lighting. Will be of interest to anyone contemplating a tungsten installation.

**Arresters and Toll Test Panels**—Are treated in Bulletins Nos. 51 and 49, respectively, published by the Kellogg Switchboard & Supply Company, Chicago. No. 51 points out the necessity for adequate protection from lightning and high potential currents, and explains, with good diagrams, the Kellogg type of arrester as also their system of installing it. No. 49 is a description of a small toll test panel with an added outline of the advantages of this system.

**Packard Type "C" High Efficiency Transformers**—A well illustrated catalogue discussing in a practical way the necessary requisites of a satisfactory transformer. An interesting table of efficiencies is appended, which shows that their largest designs reach as high as 98.27 per cent. efficiency on full load.

The new electric locomotives to be used in the New York tunnel extension of the Pennsylvania Railway are the most powerful in the world, and will develop 4,000 h.p. The total weight of each is 166 tons; maximum tractive effort, 60,000 pounds.



# Montreal and District

"Electrical News" Office,  
Board of Trade Building,  
November 25th, 1909.

The situation with regard to all classes of the electrical trade in the Montreal district, as reported to the "Electrical News" by the various manufacturers, jobbers and maintenance men, is particularly pleasing.

Throughout the past month enquiries and orders have been coming in more freely and with a greater regularity, and there is a general noticeable improvement that is hopefully looked upon by all concerned.

Mr. R. W. Robb, of the Robb Engineering Company, of Amherst, N.S., has been appointed manager of the company's interests in the Province of Quebec, with headquarters in the Canadian Express Building,



Mr. R. W. Robb.

Montreal. Mr. Robb will control the sale for this district of the well known Robb-Armstrong engines and Robb-Mumford boilers, including water tube, internally fired, and other standard types of boilers.

The Montreal Street Railway Company added ten new pay-as-you-enter cars to one of their routes last week and purpose adding this new type of car to their rolling stock as quickly as they can be turned out from the shops.

The line extensions which the Shawinigan Water & Power Company have made during the year, feeding, as they do, a big stretch of country with electric power, have opened up a fertile field for the electrical supply man. At the present time three of the large asbestos companies in the Thetford district are calling for tenders on motors, and numerous sales of the various classes of supplies required are reported.

According to the latest reports the Merchants' Light Heat & Power Company will soon proceed with their initial development of steam power, which will consist

of from 1,000 to 1,500 h.p. This company was incorporated recently by the Quebec Legislature, with a capital of \$1,500,000, and have been granted operating rights within a large area in the city of Montreal. Mr. N. Beaudry, is the secretary of the company, and it is understood that Messrs. Ross & Holgate are the company's consulting engineers.

On November 2nd, for the second time since the assignment of the R. E. T. Pringle Company, the plant and stock on hand, valued at \$60,000, was offered for sale by the liquidators. Only about twenty-five electrical men were in attendance at the sale, which took place at the Pringle factory, and the bids not being satisfactory to the liquidators the sale was adjourned. We understand that the stock is now being marketed by Mr. Irving Smith, 40 St. Antoine Street.

Messrs. Watson Jack & Company, Power Building, Montreal, have terminated their agreement with the Robb Engineering Company and have taken over the agency of the Polson Iron Works, Limited, of Toronto, for the Province of Quebec.

The new Jacobs buildings, a reinforced concrete structure, which is being erected on St. Catherine street will be equipped with its own power plant. The initial installation will consist of a 300 horse power Hornsby-Stockport producer gas engine unit supplied by the Colonial Engineering Company, and a 150 horse power Belliss-Morcom non-condensing type engine, supplied by Messrs. Laurie & Lamb. The contract for the boilers, which are required largely for heating purposes, has been awarded to the Robb Engineering Company, who will install 3 150 h.p. high pressure, 72x18-inch. return tubular boilers. Provision has been made for the reception of a fourth boiler, when required. Messrs. W. J. McGuire & Company have the contract for the installation of the heating system.

A sign of the activity in the Thetford Mines asbestos district is noted in the reports from the Jenckes Machine Company, of Sherbrooke, who are installing one 150 h.p. and twelve 50 h.p. hoisting engines, electrically operated, and three cable-way engines operated by steam, for various asbestos mining companies in the district. In each case complete crushing plants are supplied by the Jenckes Machine Company. The electric installations in all these cases are the Wagner three-phase 30 cycle type, of special design to suit the hoisting conditions in the asbestos district, and are supplied by Alfred Collyer & Company, of Montreal, the Canadian agents.

Messrs. Laurie & Lamb are supplying a new 25 ton electric crane to the Mississquoi Marble Company, of Phillipsburg, Que. This is the second one which has been installed by this company, the other, a 30 ton crane, having been erected some time ago. The Westinghouse Company, Limited, are furnishing the necessary motors, which are of the 220 volt, 60 cycle type.

The Montreal Light, Heat & Power Company are installing a battery of 1,050 h.p., Robb-Mumford, water tube boilers at their Elm works.

A large 2 stage, 14-inch Worthington turbine pump with a capacity of 5,000,000 imperial gallons every 24 hours has been ordered from the John McDougal Caledonian Iron Works Company, Limited, and will be so constructed and coupled that it may be operated at one end by means of a 400 h.p. Kerr steam turbine, or at the



other end by a 400 h.p. Allis-Chalmers-Bullock, Limited, induction motor. The coupling will provide a means of transfer without involving the least delay.

This new installation will allow the Lachine corporation to use their electric power for the light load periods of the day and to operate by steam pressure during peak load hours. The pump will be fitted with a double suction, which will admit of a domestic pressure of 80 pounds, and a fire pressure of 110 pounds.

The corporation of Lachine will make a unique installation in their water works plant in the near future and have just awarded the contracts for the required machinery.

The Canadian Light & Power Company have awarded the contract for their switchboard requirements to the Canadian Westinghouse Company, Limited. The board to be installed will be very complete and is to consist of their standard panelled, remote control type board similar in construction to those installed by the company in the large Niagara stations. The estimated cost of the board is in the neighborhood of \$50,000.

Mr. Charles Brandeis, C.E., is at present on an extended trip to several American cities.

The Eastern Engineering Company have been awarded the contract for the erection of an electric sign 60 feet by 40 feet on the new storage warehouse which has just been completed on Balmoral street for Messrs. Wilder & Company. This company also has the contract for the electrical work in the new five storey warehouse building which the Dominion Oilcloth Company have erected. Conduit work will be employed altogether in this latter installation.

Messrs. Fred Thomson & Company report the outlook for business this winter to be very encouraging. They have recently made the following sales of their standard induction motors: Seventeen motors, ranging in size from 3 h.p. to 15 h.p., and switchboard installation for the factory of the Slater Shoe Company on Latour street; 11 motors, ranging in size from 2 h.p. to 15 h.p. to the Heney Carriage & Harness Company for their new factory at Delorimier; 4 induction motors of special design to Messrs. Casavant Freres, St. Hyacinthe, Que.

The John McDougall Caledonian Iron Works Company, Limited, of Montreal, have been appointed sole Canadian agents for the Kerr Turbine Company, of Wells-ville, N.Y. The Kerr steam turbine is an impulse type wheel and opens up a new field in turbine work, on account of its adaptability for use in small units. The McDougall Company are meeting with splendid success in introducing the new turbine to the Canadian market.

The Sayer Electric Company, 14 Beaver Hall Hill, Montreal, are showing an interesting display of seasonable electrical novelties.

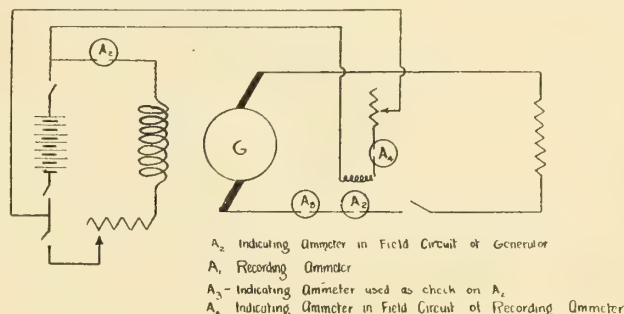
Mr. DeGaspé Beaubien, B.Sc., gave an interesting address before the McGill Electrical Club on Nov. 22nd, dealing with the "Westinghouse Students' Course."

The Standard Construction Company, of Montreal, have been awarded the contract for the construction of the transmission lines from North Bay to South River for the Nipissing Power Company, Limited. This company is also proceeding with their contract at the new Montreal jail, where they are installing the entire lighting and power system. The initial installation in the power plant of this jail will consist of about 500 h.p. The exterior wall surrounding this building will be over half a mile long, and the underground feeder system that will be used in connection with the general lighting scheme at this institution will be very extensive.

The Standard Construction Company report that they have the construction of the electric lighting and power equipment on the Jacques Cartier pier well under way. Conduit work was used altogether in this installation. They have also completed a large intercommunicating telephone system on this dock for the Harbor Commissioners.

### Canadian Society Civil Engineers

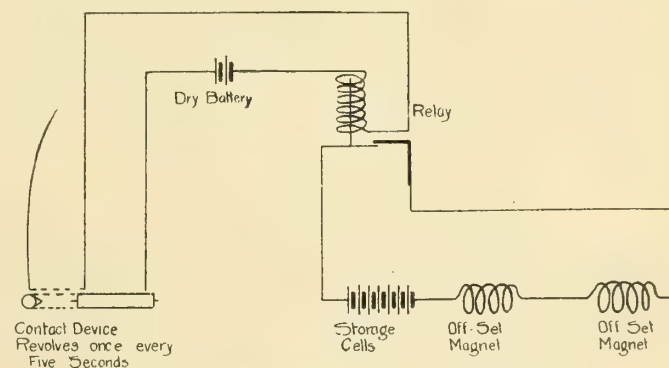
There was a splendid attendance at the first meeting of the electrical section of the Canadian Society of Civil Engineers, held recently in the auditorium of the society's Dorchester street rooms, Montreal, Que., about



Speed Recording Apparatus on University Test Car.

one hundred members being present. Professor L. A. Herdt, chairman of the section, made a brief address, setting forth the necessity for all members to interest themselves in the work of the society.

Mr. E. I. Wenger read a paper on the "Determination of Train Resistance," containing an outline of the work done by different commissions, companies and universities on this determination. The tests to which Mr. Wenger especially referred were those performed by the Railway Engineering Department of the University of Illinois. A car specially constructed for the university, and fitted with all the necessary testing and recording equipment, was operated under normal traction conditions on a branch of the Illinois Traction System. Upwards of 400 tests were made in this way, but owing to the fact that the University of Illinois will shortly pub-



Time Recording Apparatus on University Test Car.

lish the report, the speaker was unable to reproduce the results. We reproduce two cuts indicating the arrangement of the apparatus used in taking readings. The paper was discussed by a number of engineers present, among whom were Profs. Herdt and Keay, of McGill, and Messrs. Dietrich, Brownlee and Burnett.

### McGill Notes

Prof. H. A. Wilson, F.R.S., the recently appointed Macdonald professor of physics at McGill University, succeeding Prof. Ernest Rutherford, delivered his first



public lecture recently on the topic "The Electrical Properties of Flame." McGill has good reason to be proud of this latest addition to her science faculty.

Mr. Julian C. Smith, chief electrical engineer of the Shawinigan Water & Power Company was the speaker at the opening meeting of the McGill Electrical Club, held in the McDonald Engineering Building, the first Monday in November.

The McGill Club visited the Montreal substation of the Shawinigan Company in the west end of the city the following Saturday, and Mr. Smith's talk to the students took the nature of an explanation of the electrical system involved in this station. Mr. Smith's remarks regarding this substation were very thorough.

#### Shawinigan Extensions

During the present season the Shawinigan Water & Power Company have added extensively to their high tension transmission lines. From Doucet Landing to Victoriaville, a distance of 45 miles, a new 50,000 volt line has been erected and when the projected line is completed to Thetford Mines the company will have a double pole line between Shawinigan Falls and the various intermediate points.

The engineers of the Shawinigan Water & Power Company have just completed the installation of additional equipment at their Shawinigan Falls station, consisting of an 8,000 k.w., 30 cycle, three-phase, 2200 volt alternator, which is direct connected to a 12,000 h.p., I. P. Morris horizontal turbine. It is expected that this set will be shortly started up and the usual test run made.

The Shawinigan Water & Power Company have awarded the contract to the Canadian Westinghouse Company, Limited, for five 300 k.w. 30 cycle, three-phase transformers. These are rated for service on the 50,000 volt lines of the company.

The extension of the Shawinigan Water & Power Company's 50,000 volt lines to Windsor Mills, Que., and the contract formed at that point with the Canada Paper Company for a supply of electric power, is rather unique and to some extent may be rated as a triumph for electricity. The company's mills are situated in a district where an abundant supply of water power is available, yet in the face of this they have contracted for the more expensive electric load. This is partially accounted for by the fact that the water supply is not to be depended on in the summer time, but these paper manufacturers also have learned by experience that they can turn out a finer and higher valued paper where electric power is employed.

#### Montreal's Lighting Difficulties

A satisfactory settlement of Montreal's street lighting problem has not yet been reached. One proposal, to give the Montreal Light, Heat & Power Company a five years contract at \$75 per lamp, was recently referred back to committee by the council. The Fire and Light Committee now advocate the purchase of 200 arc lamps similar in design to those in use by the present operating company.

Mr. Walbank, general manager and first vice-president of the Montreal Light, Heat & Power Company, when interviewed by the representative of the "Canadian Electrical News," could not understand this latest move. "We have had no communication from the city re this matter," said Mr. Walbank. "They overlook the fact that to operate additional lamps the purchase of transformers and other necessary station equipment, such as circuit breakers and hangers, will be required." Mr. Walbank considered the company's proposition to the city with regard to the contract for street lighting as

extremely fair. In effect they had offered to furnish the city with lamps and operate them at cost price plus five per cent, this cost price to be settled by a board of arbitrators consisting of three persons, one each from the city and the company, and the third a member of the Board of Trade.

Under the present existing conditions it was maintained that the company was a heavy loser, and it was in order that they should not sustain this loss that they asked for a readjustment of the lighting rates.

The council have now decided to submit a referendum to the people on the 21st of December, to obtain power to borrow two million dollars to build a municipal lighting plant.

#### Electrical Association of Quebec

The Electrical Association of the Province of Quebec held a very interesting monthly session in their rooms in the Inglis Building on Nov. 11th. Among other business transacted, the report of the delegation appointed to consult with Mr. Bennett, of the Canadian Fire Underwriters' Association, upon the advisability of readjusting certain rates charged for inspection in Montreal was received. The committee reported that they had met with success in their conference and certain readjustments in rates had been obtained.

It was also unanimously decided that all contractors connected with the Association should demand the attendance of their employees at the course of lectures that were to be given from time to time by Mr. Bennett.

#### Suggestions for the Home

The Toronto Electric Light Company has issued an attractive little book explaining the almost innumerable electrical devices now being manufactured for use in the home. They point out that the comparatively low cost of most of these appliances will appeal to the Christmas trade. These electrical devices are already on display and may be seen any day at the Adelaide street rooms of the company.

Mr. Denis Stairs, B.A.Sc., of Halifax, N.S., who has joined the staff of the Western Canada Power Company, at Stave Lake, B.C., writes as follows: "About 130 men have been working all summer but more are coming in every day. The trees and undergrowth in this neighborhood are simply tremendous. We were surveying a line a couple of miles out through the thick woods; there were two storeys—the logs on which we walked and set up our instruments, and the solid ground below, from 10 to 20 feet down. Every now and then we would make a sudden descent and land on a bed of prickles. Bear tracks and deer tracks are all over the place."

A dispatch from St. Petersburg announces that the Russian Ministry of War is now beginning to establish a network of wireless stations for the purpose of connecting European Russia with the Far East. It is proposed for this purpose to erect a number of intermediate stations between the Baltic and the Pacific Ocean, and it is calculated that from three to four stations would be sufficient to permit of messages being transmitted from the Far East to St. Petersburg. The scheme is supported by the results obtained from the most recent triads which have been made in military telegraphy in Russia, it having been found possible to exchange telegrams between wireless stations on the Baltic and the Black Sea, a distance of 1,240 miles. It was noticed during the trials that the results were extremely favorable in damp weather, and particularly in the night time.



# Electrical Progress in Western Canada

## Activity in All Branches—A Few Recent Contracts—Eisser-Weiss Turbines for the Western Canada Power Company

The lighting system on Vancouver's costly new Granville street bridge, which was opened in July last by His Excellency the Governor-General, is deserving of more than passing mention, being the first instance of tungsten street lighting in Vancouver. Illumination is by means of two-light ornamental iron clusters, each fitted with two 100 watt tungsten lamps and holophane reflectors. These brackets are fastened to the steel uprights supporting the trolley wires, at a height of 13 feet above the sidewalk, spaced 80 feet apart. The wiring is in "Sheridized" steel conduit and lead covered wire. The system is three wire, 220-110 volt, arranged by means of two three-pole single throw switches, so that one or both of the lamps in the clusters may be lighted. There are 66 of these brackets on the bridge, which is three-quarters of a mile long, and the illumination has been found to be very satisfactory.

The work was carried out by the Electrical Construction Company, of Vancouver.

The Fraser River Lumber Company, at Fraser Mills, B.C., owners of the largest sawmills on the Pacific coast, have recently placed a contract with the Allis-Chalmers-Bullock, Limited, through their Vancouver office, for a 750 k.w. steam turbo-generator, a 15 k.w. engine driven exciter set, also motor driven exciter set, together with a six panel blue Vermont marble switchboard. Individual motor drive is to be used for operating the planers, resaws, stickers, blowers, etc., for which they have ordered the following motors: one 150 h.p. induction motor; one 75 h.p. induction motor; seven 50 h.p. induction motors; twelve 40 h.p. induction motors; three 20 h.p. induction motors; two 10 h.p. induction motors, and two 5 h.p. induction motors. All the above motors are wound for 3-phase, 60 cycle, 440 volts.

The Imperial Rice Milling Company, who are establishing a Canadian branch in Vancouver, have ordered a 75 h.p. 3-phase, 60 cycle, 2200 volt motor from the Allis-Chalmers-Bullock, Limited.

The Kootenay Development Syndicate, located at Nelson, B.C., and who are operating the Silver King mine in that district, have purchased from the Vancouver office of the Allis-Chalmers-Bullock, Limited, a 100 h.p., 3-phase, 550 volt induction motor complete, which is to operate the air compressor at present in their mine.

The North Pacific Lumber Company, at Barnet, B.C., who were burned out recently, are rebuilding their plant and are expected to use electric drive. They have placed their order with the Vancouver office of the Allis-Chalmers-Bullock, Limited, for one 600 k.w., 3-phase, 60 cycle, 2200 volt standard engine type alternating current generator, one engine type direct current exciter generator, and a three panel switchboard for the control of generator, exciter and power circuits.

The Portland Canal Mining Company, situated at Portland Canal, one of the new mining camps of British Columbia, of which much is expected, have already ordered from the Allis-Chalmers-Bullock, Limited, a 50 ton concentrating plant, complete with all auxiliary apparatus.

The Western Canada Power Company, which is en-

gaged in the development of a large water power on the Stave river at Ruskin, B.C., about 45 miles east of Vancouver, B.C., recently placed an order with a Swiss manufacturing company for five Eisser-Weiss turbine water wheels, to be delivered in the fall of 1910. The company is now preparing to award contracts for power house machinery and electrical equipment amounting to several hundreds of thousands of dollars, and all this plant will be for delivery as soon as possible.

The Cumberland, B.C., electric light company have added a new dynamo to their plant.

Six steel towers, each nearly 200 feet in height, are being erected on the railway bridge at New Westminster for the purpose of carrying the high power wires for the Chilliwack branch extension of the British Columbia Electric Railway. The towers will be the highest of their kind in Canada.

The Bull River Falls Power & Light Company is building at Fort Steele, B.C., an immense flume that will provide 10,000 h.p. at the period of lowest water. The company aims to supply light and power to all the towns in the Pass country from Michel to Moyie, and likewise operate an electric railway between Fort Steele and Jaffray.

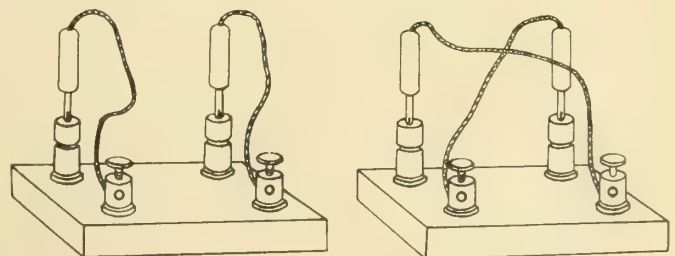
The city council of Revelstoke, B.C., has closed a contract with the Canadian General Electric Company for an arc lighting system, to replace the present incandescents. Fifty arcs will be installed.

The C. P. R. management has decided to electrify that part of its line in the Boundary country extending from Phoenix, B.C., to the Granby smelter at Grand Forks. Power will be secured from the West Kootenay Power & Light Company.

Cope & Son, general wholesale dealers and contractors, report business to be in a flourishing condition. They have just completed the purchase of the entire stock of the Barber Electric Company, including their up-to-date plating plant, and intend in the near future to launch into the manufacturing business, making a specialty of designing and assembling fixtures to order.

### A Simple Commutator

The accompanying cut illustrates a very simple and inexpensive form of electric commutator which will be found adequate for much experimental work where it is



not necessary to change the direction of the current very rapidly. Its advantage over the type using mercury cups is evident in that it may readily be moved from place to place.

# Street Railway Department

## The Application of Storage Batteries to the Regulation of Fluctuating Loads

By E. B. WALKER

In addition to the various uses of storage batteries where continuous discharge is required, such as for peak lighting, all night service, etc., there are many situations where a battery may be of inestimable benefit in smoothing out the fluctuations in the load, such as occur in all electric railway, and many isolated plants.

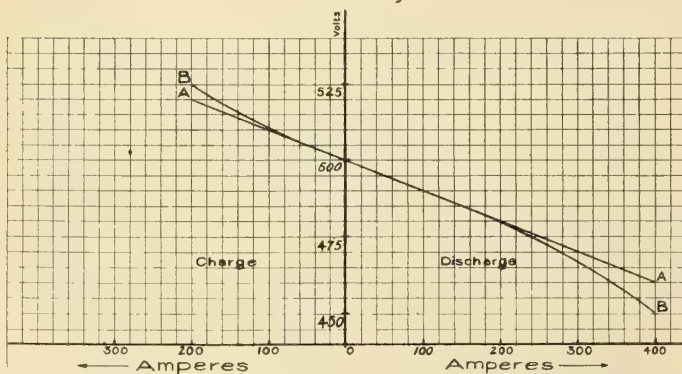
The various methods of control for lighting service such as end cell switches, rheostats, etc., are unsatisfactory for regulating work, as they are practically all hand controlled, or, if automatic, they are usually too slow in operation to follow the rapid changes in a railway load. It has, therefore, been necessary to devise automatic apparatus, which depends on these fluctuations for operation.

In the figure, curve A represents the theoretical characteristic of an 800 ampere hour battery for discharging up to the one hour rate and charging up to three hour rate. In practice this curve is affected by different conditions, such as temperature, specific gravity of electrolyte, polarization, etc. The actual curve for very rapid fluctuations is somewhat similar to B, and for more prolonged discharges drops even further as polarization increases. When a battery is installed for regulating purposes, it is, therefore, evident that some means must be found to compensate for this voltage variation.

### Regulating Without a Booster.

If we connect in multiple with a power line, a battery whose normal open circuit voltage is equal to the line voltage, it is evident that the battery will charge and discharge automatically with the rise and fall in line voltage, thus absorbing to a certain extent the fluctuations on the whole system. By referring to curve B, we see that in order to obtain a discharge at the one hour rate the line voltage must drop at least 8 per cent., and at the 20 minute rate, about 16 per cent. Such a drop is often found on railway feeders at some distance from

Characteristic of 800 Ampere hour 500 Volt Battery



the power house, but, except in the case of small plants, it would not be desirable to operate with a station voltage which drops 8 to 10 per cent. at full load. In fact, the reverse is much to be preferred, and in order to overcome this voltage drop, the various booster systems have been devised.

### Series Booster

Fig. 1 shows the series booster diagrammatically. C is the generator; B the booster armature, and F the booster series field. The operation is as follows:

At average load the battery voltage at 2.08 volts per cell would be equal to the bus voltage; the booster has then no current flowing through the fields and its voltage is, therefore, zero; when the external load increases the generator voltage drops, and the battery begins to discharge through the booster armature and series field, thus exciting the latter and adding to the battery voltage a sufficient E.M.F. to keep the battery, plus booster voltage, equal to the bus. Should the battery take an

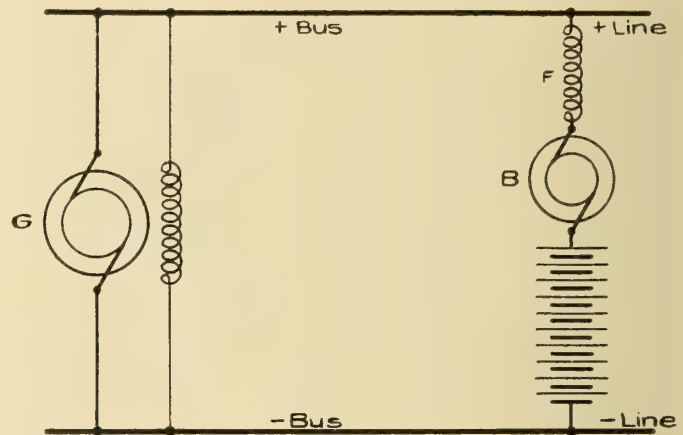


Fig. 1.  
Series Booster

undue proportion of the load, the generator voltage will rise and counterbalance this; and should the external load decrease, the generator voltage will rise and the battery will charge. It will be seen that to have satisfactory operation with a series booster, a drooping station characteristic is necessary, although the droop need only be very small.

If both the booster and battery characteristics were perfectly straight, it would be possible to obtain almost perfect adjustment of the load fluctuations by this system; but in reality, the battery voltage after a long discharge will drop below, and at the end of charge will rise above the theoretical curve, and because the series field does not easily permit of regulation to compensate for these features, the series booster is not used commercially.

### Compound Booster

To overcome the difficulties of regulation in the series booster a shunt field has been added resulting in the compound booster.

In fig. 2, G is the generator, B the booster armature, F the series field, and f the shunt field.

At average load the shunt field gives an E.M.F. of 2 to 5 volts in addition to the floating battery voltage, and the sum of the battery and booster voltage should equal the bus voltage. With variation in the external load this type operates similarly to the series booster, and, like it, requires a drooping bus characteristic.

The shunt field is controlled by a special reversible rheostat, which is so designed that the excitation can be varied by hand from zero to maximum in either direction, and thus the booster voltage can be adjusted to compensate for the polarization drop on discharge and the high voltage at the end of charge.

In a modern power station, a drooping characteristic is not desirable, and it has therefore been necessary to design a booster system that does not depend on this for



its operation, and that can even be used with an over-compounded bus. To obtain this result, two modifications of the compound booster have been devised.

### Woodbridge Compound Booster

Fig. 3 shows the Woodbridge compound booster. G.G. are the generators, E the equalizer bus, R a rheostat, B

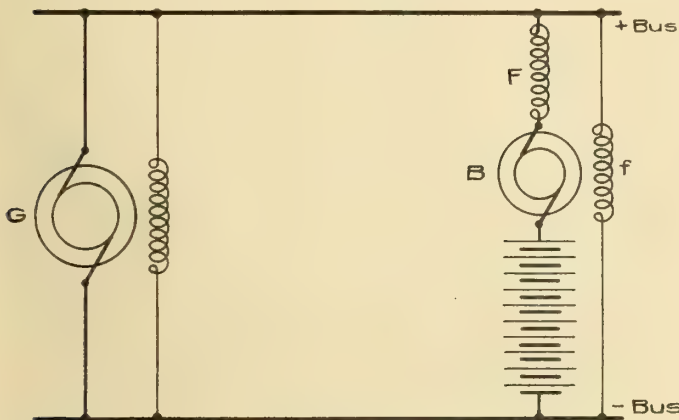


Fig. 2.  
Compound Booster

the booster armature, F booster series field, f booster shunt field. This type is similar to the compound booster, but in addition a connection is made through a rheostat and one or two battery cells to the equalizer bus as shown in the diagram. The circuit from equalizer, through battery cell, rheostat, and booster series field is so adjusted that at normal load the current from the generators passes to the positive bus by the generator series fields; the counter E.M.F. of the cell or cells being sufficient to oppose the passage of any current through the equalizer connection. If the load increases, the p.d. across the generator series fields increases, and a portion of the current will flow through the cell and booster series field, thus creating the booster voltage

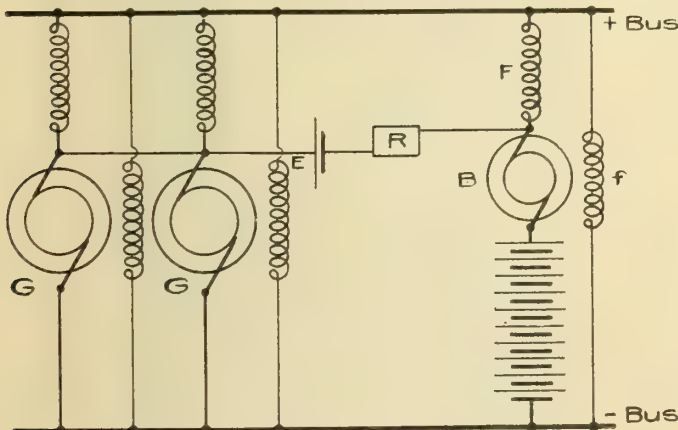


Fig. 3

### Woodbridge Compound Booster

necessary to assist the battery to discharge. If the external load decreases, the p.d. across the generator series fields decreases, and the battery cell will discharge through the generator series fields and back through booster series field, thus reversing the booster voltage and assisting the battery to charge. In a similar manner the battery cell will prevent the booster voltage from rising too high and thus giving the battery an undue portion of the load.

### Modified Compound Booster

Fig. 4 shows the modified compound booster. This type is also similar to the compound booster, but a third field coil,  $F^1$ , has been added, and connected between the battery and generator.

With normal external load the field  $F^1$  creates a booster voltage which would assist the battery to discharge except that the shunt field  $f$  creates an equal and opposing field with a resultant booster voltage of zero. If the external load increases, the field produced by  $F^1$  increases, and the battery begins to discharge; the discharge is further assisted by the series field  $F$ . By increasing the size of the inside series field  $F^1$  it will be seen that the regulation can be made more and more sensitive. With a decrease in the external load, the shunt field  $f$  overcomes the field  $F^1$  and the battery will charge. Should the battery take an undue proportion of the load, the field  $F^1$  will be weakened and the battery discharge therefore reduced.

This type has been little used commercially, and has been superseded by the differential booster, which, at about the same cost, can be built to give better regulation.

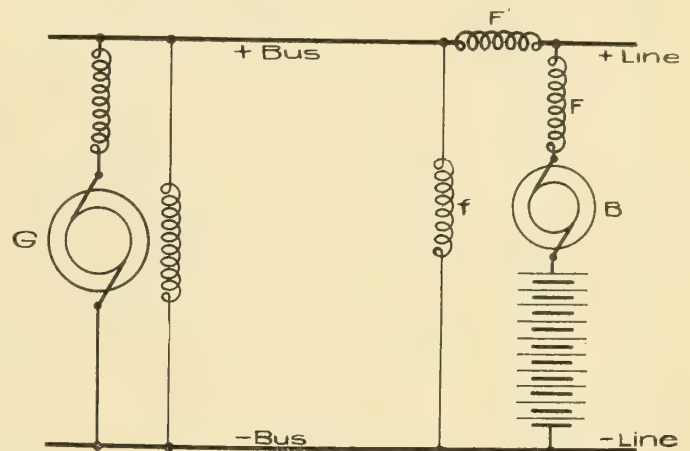


Fig. 4.

### Modified Compound Booster

### Differential Booster

All the systems described above depend for their operation on an increase in the generator load, although in many cases we can make this increase as small as we please; in this respect the differential booster is unique, for its operation is dependent entirely on variations in the external load; it can therefore be theoretically designed to give perfect regulation with absolutely constant output from the generators.

In fig. 5,  $f$  is the booster shunt field,  $F$  the inside series field, and  $F^1$  the outside series field. With normal external load the field created by the generator current flowing through the series fields  $F$  and  $F^1$  is equal and opposite to that created by the shunt field  $f$ , the booster voltage is, therefore, zero, and no current flows through the battery. With an increase in the external load the outside series field  $F^1$  is strengthened and over-balances the shunt field, causing the booster to assist the battery to discharge; similarly with a decrease in external load  $F^1$  is weakened and  $f$  creates a field which reverses the booster voltage and assists the battery to charge. The inside series field  $F$  prevents the battery from taking too large a portion of the load, since any diminution of the generator load would weaken this field, and reduce the booster voltage; similarly an increase in the generator load will raise the booster voltage.

With a perfectly adjusted booster and absolutely

steady generator voltage, this field would, of course, be unnecessary, but as these conditions are never met in practice, it serves to prevent any lack of exact adjustment from materially affecting the regulation.

By referring again to fig. 5, it will be seen that the inside series field  $F$  must be large enough to carry the total generator load, and outside the series field  $F^1$  must carry the generator load plus the battery load, or the maximum station load. For the larger stations the enor-

is greatly increased, it may also be necessary to change the coil  $C$  and armature  $A$ . In small stations the coil consists of three or four turns of laminated copper with a cylindrical soft iron armature through the centre; and in larger stations an armature of horseshoe shape is suspended over a slight bend in the main bus bar.

(Concluded in January Issue)

### Various Quebec Companies Merged

Application has been made at Ottawa for letters patent of incorporation of the Quebec Railway, Light, Heat & Power Company, with a capital stock of \$10,000,000. The new merger will include the Quebec Railway, Light & Power Company, which operates the city and suburban electric railway services, supplies electric light and power and controls the Montmorency Power Company; the Quebec Gas Company; the Frontenac Gas Company; the Seven Falls Company, and several smaller companies.

The general manager of the merged interests will be C. E. A. Carr, until recently manager of the Quebec Gas Company. Mr. Carr is an Ontario man, having spent the early years of a successful career on his father's farm, near Thornton, in Simcoe County. Moving to Toronto, his instinctive interest in street railway matters soon brought him into the office of the Toronto Street Railway Company, where he became William Mackenzie's private secretary. From this office he was appointed general manager of the London Street Railway Company, and while still filling this position gave evidence of one of his most prominent characteristics, viz., infinite capacity for hard work, by also assuming the general managership of the Montreal Park & Island Railway Company.

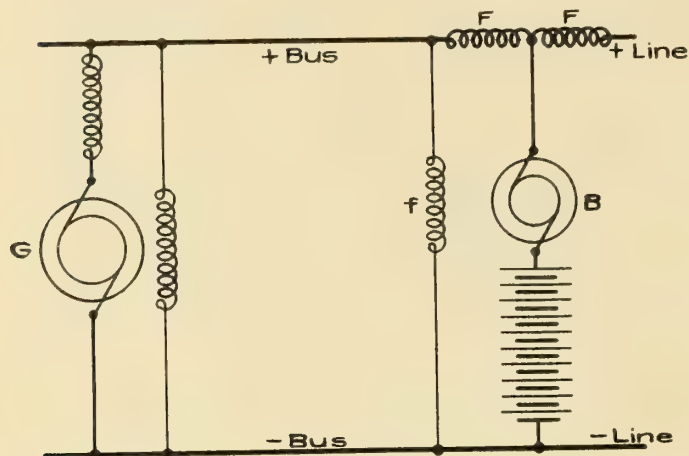


Fig. 5.  
Differential Booster.

mous quantity of copper required for these series fields has made the cost of the differential booster very high, and consequently the Woodbridge compound has been largely used. The introduction of the carbon regulator, however, has dispensed with the necessity of using large series fields.

### Carbon Regulator Boosters

Fig. 6 shows the carbon regulator applied to the regulating shunt booster.  $B$  is the booster armature,  $f$  the booster shunt field,  $E$  the exciter armature,  $F$  the exciter field,  $RR^1$  are piles of carbon discs forming the regulator,  $L$  a lever pivoted in the centre and resting on the tops of the carbon piles,  $S$  a spring to control this lever,  $C$  a small coil in series with the main bus through which is suspended the iron armature  $A$ . With normal load the current flowing through the coil  $C$  exerts sufficient pull on the armature  $A$  to exactly balance the spring  $S$ , consequently the lever  $L$  exerts no pressure on the carbon piles. As the resistance of the carbon piles in loose contact is very high, practically no current flows through them from the battery. If the load increases, the coil  $C$  exerts a stronger pull on the armature  $A$ , therefore overcoming the tension of the spring  $S$  and increasing the pressure on the carbon discs. This so reduces the resistance of  $R$  that current flows from the battery connections  $y$ , through  $F$  and  $R$  to  $X$ ; this creates an exciter voltage sufficient to cause the booster to assist the battery to discharge. If the load decreases, the pull on  $A$  is relaxed and the spring  $S$  causes the lever  $L$  to press on  $R^1$ , so that current will flow in an opposite direction through the exciter field, from  $X$  through  $R^1$  and  $F$  to  $y$ . With all forms of booster using a series coil which carries the station or generator load, adjustment to suit changing conditions such as increased generator capacity, is necessarily difficult and expensive, because these series fields are not easily designed to act satisfactorily over a wide range of loads. But with the carbon regulator, the proportion of generator load can be adjusted instantly by simply increasing or decreasing the tension of the spring  $S$ , and if the generator capacity



C. E. A. Carr

From London and Montreal, Mr. Carr was called to Helena, Montana, as manager of the Helena Light & Railway Company, which, after five years, he abandoned for the more congenial atmosphere of Quebec, where for the past two years he has been general manager of the Quebec Gas Company. By his latest move Mr. Carr assumes the control of about the fourth largest electrical operating company in Canada.



# TELEPHONE TOPICS

## High Efficiency Transmission Circuit for Telephone Train Dispatching

By H. D. CROUCH

The use of the telephone for the handling of trains is not by any means new. For several years a number of railroads have been using the ordinary local battery, bridged telephone for this purpose, the various stations

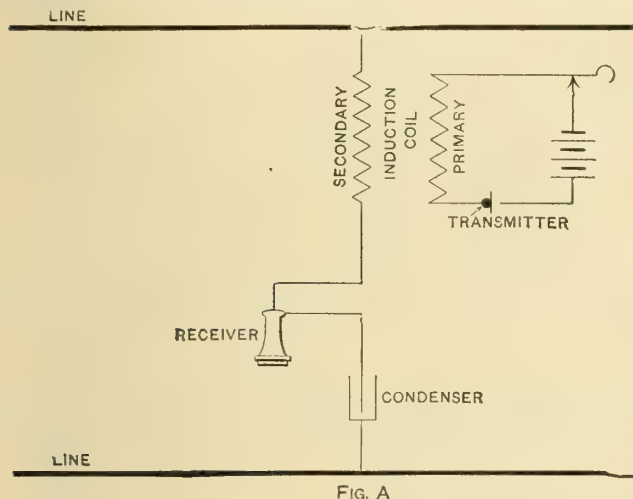


FIG. A

being called by code ringing. This arrangement was found to serve very well for short lines. When the attempt was made to use this arrangement on longer lines with a larger number of stations, it was found that the transmission would be seriously impaired when one or more of the receivers were off the hook at the same time.

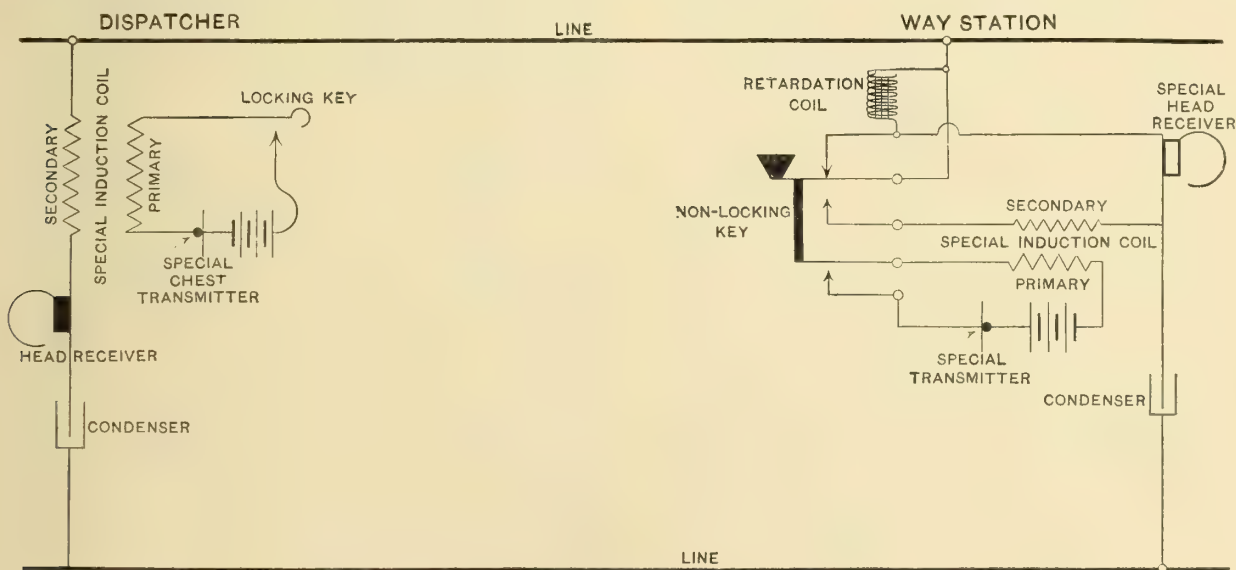


FIG. B

This difficulty was very noticeable later on when the selectors began to be used and the telephone was introduced upon the more important and busier roads.

Figure "A" herewith shows schematically the usual arrangement of a local battery telephone. Originally this arrangement was used at both the dispatchers' and way stations. From the sketch it will be seen that the bridge during the conversation consist of a condenser,

receiver and secondary of the induction coil in series. The total impedance of this bridge to talking currents is approximately 600 ohms, about 200 ohms of which are in the receiver and therefore active for receiving purposes. It is obvious that when a number of these sets are bridged across the line at once, the joint impedance of the bridges in parallel is very low and the transmission correspondingly difficult between terminals or widely separated stations.

To meet conditions imposed by this class of service, the Western Electric Company has devised the circuit shown schematically in fig. "B." The dispatchers' equipment is substantially the same as shown in fig. "A" except that special apparatus is used. In order to provide the dispatcher with the best possible receiving he is provided with instruments of fairly low impedance. A head receiver is used and is in series with the induction coil; the latter is specially designed to give the best possible transmitting consistent with good receiving. A locking transmitter key is provided inasmuch as the dispatcher will ordinarily require both hands for his work. The transmitter itself is of the chest type and is special for this purpose.

It will be noted that the way station circuit is radically different from that shown in fig. "A." In order that a number of stations may be listening at once without serious detriment to the transmission, it is apparent that each must constitute, when listening takes place, a bridge of very high impedance. Further, in order to give efficient receiving, a large proportion of this impedance must be in the receiver itself. This precludes the possibility of having the receiver in series with the induction coil because when transmitting, all the secondary talking current passes through the receiver. The high impedance of the receiver would cut down the

transmitted current and in addition to this there would be the serious objection of excessive side tone.

A study of these conditions led to the conclusion that the use of a push button or key which in its normal position gives the best possible receiving conditions, and in its operated position gives the best possible transmitting, would be advisable. By referring to fig. "B," it will be noted that normally, i.e., in the listening condi-

tion, there is a circuit through the receiver and condenser in series directly across the line. When the key is thrown to the talking position it is seen that the receiver in series with the retardation coil (normally short circuited) is put in parallel with the secondary of the induction coil and these bridged across the line through the condenser.

When the key is normal the receiver is directly across the line through a condenser which gives the best possible receiving conditions. The receiver is specially wound and the impedance of the bridge at this time is about 2,400 ohms to talking current, practically all of which is in the receiver and consequently active for receiving. When the key is operated the induction coil being bridged directly across the line through the condenser gives the best possible condition for transmitting. The function of the retardation coil is to prevent excessive side tone in the receiver when talking, also by raising the impedance of the receiver circuit, more of the transmission is forced upon the line. This retardation coil is so designed that in case the dispatcher wishes to break in, a sufficient volume of the dispatcher's voice currents will pass through the receiver to attract the operator's attention.

The induction coil and transmitter are also special for this purpose. Three cells of dry battery or their

equivalent are used for transmitter battery, the latter being in use only during the time the operator is actually talking. In developing this circuit and apparatus, the problem has been studied as a whole, rather than as a problem of transmitting or of receiving alone. The various pieces of apparatus have been designed to work together, having in view the best possible result as a whole. This circuit is in use on systems up to over two hundred miles with as many as 45 stations; 20 of these stations can be listening simultaneously without seriously impairing the transmission of the line.

The Northern Electric & Manufacturing Company, Limited, of Montreal, have during the past year equipped four divisions of the Canadian Pacific Railway for telephone dispatching apparatus, similar to that above described. Each train on the various divisions is equipped with a special type of portable set, line pole and flexible cord, which enables the train crew to tap on to the train wire at any point along the division and get into direct communication with the dispatcher by telephone.

The service given by this apparatus has been exceptionally satisfactory to the railway officials, and it is anticipated that during the coming year they will equip several more divisions with telephone dispatching apparatus.

## Is the Telephone a Natural Monopoly?

### Statistics in Favor of Competition—Some Conclusions from an Independent Viewpoint—By Francis Dagger

Those among us who have spent their lifetime in the telephone business, from our youth up, have been familiar with the oft-repeated statement that the telephone is a natural monopoly. I must confess, however, that I have never met with anyone sufficiently courageous to supplement this bald statement with anything tangible in the form of a convincing argument in its support. Moreover, the statement has always been made by those who, actuated by personal interests, did not wish to invite competition. In other words, this doctrine has always been preached by the friends of monopoly, who have found it a somewhat plausible reason with which to console a long-suffering people, who for so many years were the victims of an inefficient telephone service at exorbitant rates.

I call your attention to these facts at the outset because I wish you to note that the assertions in support of the contention that the telephone is a natural monopoly, is the evidence of interested parties, and therefore should be treated accordingly. On the other hand, it may be argued that those who advocate the theory that the telephone is not a natural monopoly, are desirous of maintaining competitive telephone systems, and consequently their evidence is only of a value equal to that of their opponents. I think you will also agree with me that if you were operating a telephone plant in some town where you were fortunate enough to be in sole possession, you would be inclined to the belief that the telephone should be considered a natural monopoly so far as your territory was concerned.

My subject, however, is too important a one to be decided by the views of those who are pecuniarily interested in the success of monopoly or competition. The telephone is one of the greatest public benefactors the world has even known. By its invention science conferred upon humanity a sixth sense (if I may so use the term), viz., the power of conversation with countless thousands of our distant and unseen fellow beings, at

times, it may be, when this was the last available resource which stood between the loss of property, fortune, or often of life itself. There is no business so insignificant, or home so humble in which a telephone would not prove a boon.

There are tens of thousands of citizens in Toronto, and hundreds of thousands of people in Ontario, who would take the telephone to-day, if proper methods were adopted to furnish the service. It is in the consideration of these methods that the question arises, which forms the title of my paper.

If the telephone is a natural monopoly the fact that the business has remained in the almost absolute control of a private corporation for over 25 years, would not redound to the credit of our statesmen, without regard to party, for as a natural monopoly it should belong to the people. If the telephone is a natural monopoly, I must say that nature has been very unkind to it, for a more stunted production it would be impossible to imagine, than that presented by the telephone industry when it emerged from twenty years' monopolistic control. Just think of it, from twenty years of monopoly in the United States and Canada, it emerged a sickly plant some twelve inches high. To-day, after fourteen years of healthy competition, it is a sturdy tree towering 28 feet above the ground. In other words, twenty years of monopoly placed less than a quarter of a million telephones at the service of the people, while fourteen years of competition has extended the use of this utility to seven million subscribers. Judged, therefore, by the growth of business, there is no doubt that the verdict of the people is emphatically on the side of competition.

It is further a significant fact that in the past no company has been able to retain a monopoly in the telephone business without the protection of the state, province, or municipality. Wherever this protection has been withdrawn the result has been the establishment of a competitive telephone system. In Ontario, for in-



stance, the one obstacle in the establishment of an independent service in the principal towns and cities, has been the granting of five-year exclusive agreements to the Bell Telephone Company, or the reluctance of municipal councils to grant franchises, upon equitable terms, to independent companies. In no case can it be truthfully stated that the Bell Telephone Company is enjoying a monopoly because the natural conditions surrounding its business are such as to render competition impracticable or undesirable. On the contrary, the "Bell" system remains a monopoly just so long as the municipality keeps the door closed against competition. In other words, the monopoly is kept alive by artificial means, and therefore cannot be a natural one.

Almost the only argument which has been used in support of the theory that the telephone is a natural monopoly, is the assertion that competition means that the majority of people must have two telephones, thereby entailing the payment of two rentals, which increases the cost of service to the user. This argument has been amply refuted by a recent statement showing conditions existing in 18 cities in Illinois, Iowa, Indiana, Michigan and Ohio, which records that out of 44,293 "Independent" and 33,305 "Bell" stations, only 4,304 business and 1,662 residence subscribers have both telephones. That is, only 5,966 subscribers out of 77,598, duplicate the service—less than eight per cent. In Iowa, out of a total of 168,148 "Bell" and "Independent" subscribers, there are only 5,426 duplications, or 3.2 per cent.

A careful analysis of telephone figures in Cleveland, Dayton and Toledo, Ohio; Indianapolis, Ind.; Kansas City, Kan.; and Louisville, Ky., shows an average duplication of only 12 per cent.—that is 12 out of each 100 subscribers take both "Bell" and "Independent" telephones, while the remaining 88 get all the service they require by renting one telephone. It is further conceivable that six out of each twelve subscribers who now have both services, would still require two telephones to handle their business, if there was only one system in each of the cities named. These facts prove beyond doubt that telephone competition means "the greatest good to the greatest number" in that it secures to at least 90 per cent. of the telephone users lower rates and an improved service.

The figures I have quoted so far relate to the United States and Canada. In regard to this Dominion, you know what happened before the advent of the independent telephone movement in 1905.

Before that date the policy of the monopoly was to select the large and more densely populated centres where the largest profits could be earned. The smaller towns and villages were absolutely neglected, or at the best had to be content with a toll office. The request of the farmer for service invariably met with either a curt refusal, or a demand for terms so exorbitant as to be absolutely prohibitive. Hundreds of cases might be quoted illustrating the arrogant treatment which the farmer received from the "Bell" monopoly. Every conceivable effort was made to stifle the movement for rural telephones at its inception. Time and again farmers have established a service, which this monopoly had refused to furnish, only to find their lines paralleled and their capital placed in jeopardy by the threats, intimidation, and other forms of persecution of "Bell" agents. In the early days, before rural telephone systems became so popular as they are to-day, small companies in Quebec and Ontario have been forced into bankruptcy by the unscrupulous methods of "Bell" agents, and in this way thousands of dollars have been lost by farmers and others. In some cases men have been ruined by the

tactics of these agents in their efforts to discourage rural telephones in Canada.

Twenty-five years of "Bell" policy in Canada, from 1880 to 1905, resulted in the placing of 90,000 telephones, less than 67,000 of which were in the territory of the Bell Telephone Company of Canada, the balance being distributed among the Maritime Province, British Columbia, and a few small independent companies. In 1905, Ohio, with only two-thirds the population of Canada, was operating 300,000 telephones, 200,000 of which were furnished by independent companies as the result of ten years' competition. To-day there are over half a million telephones in that state.

I do not wish to weary you with figures, but will just state one or two facts illustrating the popular feeling in regard to competition in large cities. The city of Cleveland, before competition, had 5,250 telephones; today there are over 55,000, and there is a crying demand for more. Los Angeles, Cal., which has a population of 320,000, or about that of Toronto, under monopoly had 13,000 telephones; today under competition it has over 62,000.

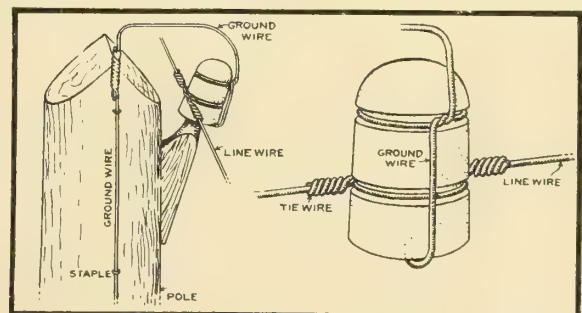
Recently a committee appointed by the city of Chicago after months of investigation and discussion of the telephone situation, decided, by a vote of 8 to 3, that competition, or the active possibility of it, was the only check which the city had on the operations of the Bell Telephone Company.

I might take up your time indefinitely with examples furnishing convincing proof that in no part of the world have the people enjoyed the benefit of the telephone to the same extent, under monopoly, as they have under competition. Monopoly has always, and will for all time restrict the use of the telephone to a few; while competition has not only improved, and cheapened the service, but it has placed it within the reach of innumerable thousands who, otherwise, would have been deprived of its benefits.

### A Simple form of Lightning Arrester

We use a device such as is shown in the accompanying diagram to relieve our lines of lightning charges. The only material required is a piece of No. 12 iron wire and a double groove porcelain insulator.

We bend the piece of iron wire to make a hook about one-half inch deep, to clasp the bottom of the insulator. The line wire is placed in the lower groove and tied in the regular way. The wire carrying the hook is then set



in place on the rim of the insulator, properly bent, tied in the upper groove, and connected to a ground wire. Between this and the tie wire there will be a small gap, the width of which can be regulated by the lineman, which will provide an escape to ground for lightning. The hooked wire must be drawn tightly around the groove so that it cannot move, and ground the line.—Telephony.



## Some Aspects of the Tungsten Lamp

The second monthly meeting of the Toronto section of the American Society of Electrical Engineers brought a large attendance to hear Messrs. G. S. Merrill and J. S. Hoit, of the National Lamp Association, of Cleveland, experts on tungsten lamp manufacture and installation. It is probable no papers have been read before this society that have been listened to with greater interest or been discussed with greater freedom.

An interesting part of Mr. Merrill's paper dealt with the description of the method of manufacture of the tungsten filament. Tungsten metal is obtained in a very pure state and mixed with some hydro-carbon such as starch, sugar, camphor, etc., to give it plastic properties. This mixture forms a paste which must be absolutely smooth and uniform and without the slightest grain. This paste is placed in a small cylinder and forced under a pressure of about 32,000 pounds per square inch through small diamond dies, some of which are no more than .0019 inch in diameter, or about one-third the size of the average hair. As the filament passes through the die it is wound on clips and then heated either in a vacuum or an inert gas, such as nitrogen, until every trace of the hydro-carbon has been driven out.

The paper dealt with the difficulty of obtaining a filament, as yet, that would retain its flexibility at a low temperature, and recommended the lighting of lamps while cleaning them.

A number of lantern slides were shown illustrating many of the characteristics of tungsten lamps, their length of life, their power consumption, the percentage of heat energy evolved, comparisons being drawn in many cases between the tungsten and other types of incandescents. One comparison, with carbon filament lamps, showed that a pressure drop of 10 volts only diminished the brilliancy of a tungsten as much as a drop of 7 volts would do with carbon.

In the discussion that followed the point was brought out that the process of manufacture of tungsten lamps is undergoing constant changes and that higher efficiency may yet be confidently looked for with greater stability of the lamps themselves. For example, it was instanced that the 250 watt lamp, a few months ago a commercial impossibility, has already proven a great success.

Mr. Hoit dealt with the various systems of street lighting and drew the conclusion that nothing gave so good results as tungstens, set comparatively low, 40 to 80 c.p., and not too far apart.

The next meeting will be addressed by Mr. P. W. Sothman, chief electrical engineer of the Hydro-Electric Power Commission, on various phases of the Government installation.

## Canadian Tungsten Experiences

Mr. Walter Mitchell, of Port Stanley, writes as follows: "I have read with interest the article in the November issue of the 'Canadian Electrical News' on 'Tungsten Lamp Experiences.' As these relate to American cities and towns only, I will give you our experience with tungsten lamps in an Ontario village.

"On January 13th we commenced using tungsten series lamps in our street circuit for renewals and extensions, and now have 44 tungsten lamps in service. These lamps are installed in an ordinary gooseneck fixture on poles, about 15 feet from the ground, and are subject to considerable vibration from wind, etc. Of the 44 lamps installed, 42 are still in service. Of the two disabled lamps, one, after burning 175 hours, was broken by a boy throwing a stone through it; the other burned 1,425 hours, and on examination we find the tungsten

filament disconnected from the copper wire in the lamp base but not otherwise injured. I have examined some of these lamps, that have been burning 1,400 hours, and the light appears to be as good as when they were first installed and there is no appearance of deposit on the glass. These 44 lamps have been burning on an average 600 hours each, some of them as long as 1,500 hours.

"On Jan. 13th, we had 61 carbon lamps in this circuit; to-day we have 35 carbon and 44 tungsten; total, 79; and are using less current than we were in January with 61 carbon lamps. The lamps are General Electric, series,  $3\frac{1}{2}$  amperes. The circuit is controlled by a constant current transformer, primary voltage 1,100, secondary amp.,  $3\frac{1}{2}$ . The regulation on this circuit is very good."

## Benjamin Tungsten Shock Absorber

This shock absorber consists primarily of a strap iron stirrup, a loose bushing centrally located, supported by a coil spring and tapped to receive the fixture stem. The compression spring forms a resilient connection between the supporting element (iron stirrup) and the fixture. The stirrup has two feet provided with screw holes for attaching to the supporting surface, and when so attached takes the place of an ordinary crowfoot. An additional strap centrally threaded to fit a  $\frac{3}{8}$ -inch insulating joint is attached to the stirrup by means of two screws. This strap may be omitted for attaching to a wooden ceiling or block. In one case, the device thus becomes a shock-absorbing hickey; in the other, a shock-absorbing crowfoot.



The device is furnished with one of three springs varying in stiffness to correspond to the weight of the fixture with which the absorber is to be used. The light spring will take a fixture from one to four pounds; the medium, from four to ten

pounds; and the heavier, from ten to sixteen pounds.

In addition to other good features, this shock absorber incorporates an essential for successful devices of this character in that provision is made for locating it at the ceiling or the point of fixture support, rather than above the individual lamp sockets. The initial shock of a sharp or sudden jar from the ceiling or point of support is intercepted before it reaches the fixture proper, while any subsequent vibration which might be transmitted is dissipated by the weight and consequent inertia of the fixture before it reaches the lamps themselves.

## The Canadian Carbon Company

Mr. Alfred Landau, manager of the Canadian Carbon Company, Limited, announces that his company has just purchased the entire battery plant of Electrical Specialties, Limited. Hitherto Electrical Specialties, Limited, engaged in the manufacture of X Cell batteries, and also conducted a general automobile and motor boat supply business. They have now removed to 115 Church street, Toronto, where they will continue to carry on the supply business on a larger scale. The Canadian Carbon Co. will have their offices and plant at 12-14-16 Shuter street, Toronto. Their entire time will be devoted to the manufacture of X Cell batteries, and to the importation of Fabius Henrion carbons. The present agreements, terms and prices on X Cells will be maintained by the Carbon Company.



## Personal Mention

We understand that Mr. J. F. Vandeleur, of Vandeleur & Nichols, electrical engineers, has combined business with pleasure in his trip to England, and that when he returns early in the new year he will bring Mrs. Vandeleur with him. The bride-to-be is Miss Owen, of Sheen Lodge, Richmond Park, Surrey. Miss Owen is a daughter of the late Wm. Owen, of the Foreign Office, and grand-daughter of Sir Frederic Owen, the well known archaeologist.

Mr. Harold W. Price, B.A.Sc., was recently elected chairman for 1910 of the Toronto branch of the American Institute of Electrical Engineers. Mr. Price has been prominently identified with the work of the local branch, having served on the executive for several years. He is now Associate Professor of Electrical



Mr. Harold W. Price, B. A. Sc.

Engineering at Toronto University, and as assistant to Prof. Rosebrugh is largely responsible for the present high state of efficiency of the electrical engineering course. He is the originator of the Price System of Automatic Railway Signals and Train Control. Mr. Price is an honor graduate of Toronto University.

C. E. A. Carr has been appointed general manager of the newly formed Quebec Railway, Light, Heat & Power Company.

R. B. C. Hammond has been appointed to the position of city engineer at Fernie, B.C. His duties commenced on Nov. 1.

We congratulate Mr. J. V. Webber, superintendent of the meter department of the Toronto Electric Light Company, on his marriage recently to Miss Ashall, of Sherbourne street, Toronto. The happy event was made the occasion of a number of tangible expressions of the good feeling that exists between Mr. Webber and his business associates, among them being a presentation of silver, with an appropriate address, from the inspection department, and a similar expression from the gen-

eral office staff, of the Toronto Electric Light Company. Miss Ashall is a graduate of the Roosevelt Hospital, of New York.

Mr. A. F. Townsend, manager, for the last three years, of the Cape Breton Electric Railway, has resigned his position to accept the managership of one of Stone & Webster's large New England companies. Mr. Townsend leaves many warm friends behind, who rejoice, however, at his well deserved promotion. He is succeeded by Mr. H. C. Foss, manager of the Sydney & Glace Bay Railway, who will in future control the destinies of both companies.

## Legal Decisions

**Decision Regarding Highway Rights** — Township of Bucke v. New Liskeard Light, Heat & Power Company. Divisional Court of Ontario. The defendants, an electric light company, placed poles upon plaintiffs' highway without express permission. Plaintiffs passed by-law allowing poles to remain on payment of rental, the execution of bond to indemnify the plaintiffs against actions for damages, and payment of cost of obtaining legislation to confirm the by-law. This the company failed to do. The plaintiff issued a writ claiming the rent provided for in the by-law. Held, that the defendant company had no right upon the highway without legislative sanction.

**Action re Improper Method of Computing Power** — Attorney-General for Ontario v. Canadian Niagara Power Company — The action was on a contract between the commissioners of Queen Victoria Niagara Falls Park and the defendants, by which the defendants were allowed to take water from the Niagara river to generate and sell electric energy, and to settle disputes as to the proper way of measuring the amount of electricity. Plaintiffs measured the energy on certain days and demanded rates for the intervening time as per that measurement. Held, that this was not the proper mode of computation, but that the amount generated and sold from day to day was the proper mode of computation. Action dismissed with costs.

**Negligence Causes Death by Fall from Ladder While Repairing Electric Light** — Paquette v. Rideau Skating Club — Plaintiff, widow and administratrix of Alphonse Paquette, brought action against defendants claiming damages for death of husband, an electrician in the employ of defendants, who was thrown from a high ladder while repairing an electric light, in the centre of defendants' rink, by reason of a boy skating against said ladder. Plaintiff alleged negligence that the ladder supplied by defendants was not properly constructed for the purpose for which it was used, and was unsuitable for said purpose, being defective in design and manufacture. At the trial Anglin, J., dismissed the action on finding of the jury. The Divisional Court on appeal vacated this judgment and ordered a new trial. The Court of Appeal reversed the Divisional Court and restored the trial judgment on the grounds that the unsuccessful party must be able to point to something like mistrial or unreasonable conduct on the part of the jury in order to attack a verdict for his opponent.

The Electrical Machinery Company, which is under the management of Mr. A. J. Phillips, assisted by Mr. James Watt, have removed to their handsome new offices at 111 Simcoe street, Toronto. They will specialize on repairing and second hand electrical equipment.



## Current Literature

**Economy of the Electric Drive in the Machine Shop.** A. L. Deleuw.—In this paper are shown the most salient points which affect the economy of the electric drive in the shop and also, in a general way, the proper relation between the motor and the driven machine.—*Electrical Review*.

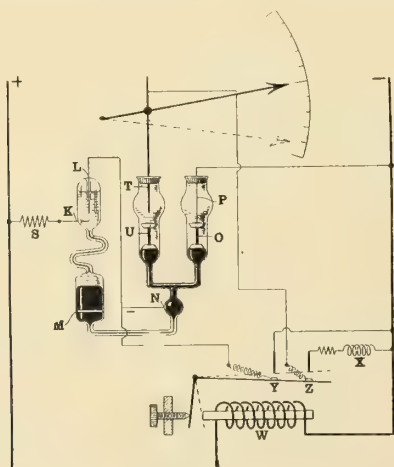
**The Bellini & Tosi Directional Wireless System.** A. De Courcy.—A description of apparatus used and successful experiments performed by the two Italian scientists having in view the remedying of the common defect of wireless instruments of sending out waves in all directions.—*Electrical Review*.

**Parallel Operation of Machines with Series Fields.** H. L. Beach.—A short article dealing with the precautions to be observed in making connections and adjustments in motors and generators having series fields. The various combinations are divided under two heads and discussed separately; 1, series and compound-wound generators; 2, series and compound-wound motors.—*Electrical Journal*, Nov.

**Modern Methods of Artificial Illumination.** L. Gaster.—The author first considers electric glow lamps, and describes various types which have been brought out. Arc lamps and vapor lamps are next dealt with. He then passes on to gas-lighting systems, and finally to those in which petrol, acetylene, etc., are employed. Illumination in special cases, luminous efficiency and physiological effects are also considered.—*Electrician*.

**The use of Buffer Batteries in Connection with Electric Traction Systems.** By A. W. E. Harris.—The author deals with the general considerations governing the installation of a battery, and emphasizes the need of designing it as an integral part of the whole scheme. The necessity for using an automatic booster is indicated, and the principal types of booster are then described, diagrams of each being given. Finally, results actually obtained in practice are illustrated by curves from quick-speed recording instruments.—*Electrician*.

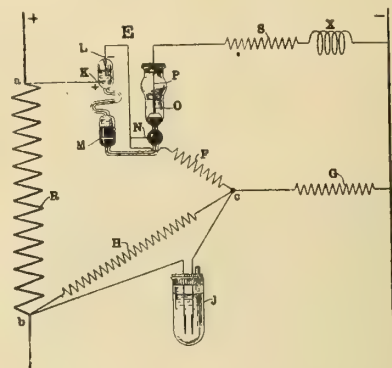
**Electrolytic Time-Limit Relay.**—An illustrated description of a new time limit relay devised by W. B. Thorpe. The construction is shown in figure. On the occurrence of an overload, the series coil W closes the cell circuit at Y. Directly electrolysis commences the float O is lifted so that a circuit is completed. If the overload continues, electrolysis continues until the float U comes in contact with the adjustable contact T. This contact completes the circuit of the tripping coil X through



Z, and the main switch is opened. The time which elapses before this occurs is determined by the position of T, and is denoted on the scale in seconds, so that the relay can readily be set to any desired value of the time. Should the overload cease before the predetermined time has elapsed, however, the cell circuit is opened at Y, but remains closed through the contact at P, so that the electrolysis continues until the float U touches T as before. In both cases the evolved gases are fired almost immediately after this by the breaking of the circuit at the level of the electrolyte, as in the case of the meter, but in the latter case contact between U and T does not complete the tripping-coil circuit, as it is broken at Z owing to the overload magnet having weakened. After even a mo-

mentary overload, however, the complete cycle of electrolysis and recombination takes place, so that a definite and constant time element is ensured. Although the right-hand bulbs of the cell are open to the atmosphere, the platinum mercury joint at M prevents the escape of the gases or electrolyte, and the cell therefore never requires refilling. This relay can be applied by substituting a shunt tripping coil for the usual series coil.—*London, "Electrical Engineering."*

**Electrolytic Watt-hour Meter.**—An illustrated description of a new electrolytic watt hour meter designed by W. B. Thorpe. In the fig. E is the registering cell, which, it will be noticed, is not connected directly across the main shunt R, but is placed across the mains in series with a high resistance G, and another high resistance F, these being so proportioned that the pressure across ac is about equal to the back e.m.f. of the cell, while that across ad is the full mains'



pressure of 100 or 200 volts. The other end b of the main shunt R is connected to the point c, through a resistance H, and therefore, neglecting the drop across R, the pressure across H is also about equal to the back e.m.f. of the cell. First, with regard to the effect of variations in pressure, a rise in the main voltage would cause a larger current to flow. First, with regard to the effect of variations in pressure, a rise of pressure across bc and ac. Although a very slight rise of pressure across the cell E is required in order that it may register an increased energy consumption in proportion to the increase of pressure, the actual rise consequent upon the total rise across ad would be too high. This rise could not be reduced by altering the proportions of F, H, and G, as it is essential that the pressure across bc should be about the back e.m.f. of the cell, so it was necessary to devise a third parallel path to E and H which would take the extra current consequent upon the increase in the mains' pressure without increasing the drop across ac and bc. An electrolytic cell J, called the "absorption cell," is employed for this purpose. It comprises a test tube in which are two plates of nickel 160 mm. square immersed in a 20 per cent. solution of caustic soda. If these nickel plates were infinitely large, the cell would take any current without any rise in the pressure across bc, which would remain at the critical voltage of the cell. Actually, however, they are of such dimensions that the pressure across bc (and therefore across ac) rises in proportion to the increase in the supply pressure to such a degree that the cell registers an increased amount, making the meter in effect a wattmeter. It should be mentioned that practically no gas is generated in the "absorption cell," the little that is generated being occluded in the plates.

When the load circuit is open the various pressures are so balanced that the voltage across the registering cell E is very slightly more than the back e.m.f. of the cell. This balance is obtained in setting the cell in the first instance by adjusting the resistance H, this being the only adjustment necessary to set or correct the meter. A very minute quantity of gas is evolved under these conditions, but this is occluded by the nickel electrodes, and does not influence the reading of the meter. Directly the load circuit is closed, however, current flows through R, and a difference of potential is produced between the points a and b. This difference of potential is immediately effective in driving a current through the cell E, as it raises the pressure across ac. This increase in the pressure being proportional to the drop across R, the water is electrolysed in proportion to the current taken, and, further, any variation of the supply pressure is accompanied by a corresponding variation in the amount electrolysed, as already explained, so that the rate of electrolysis at any instant is proportional to the watts then being consumed by the load. At full load the cell takes a current of about 0.003 amp. It is stated that the meter will read correctly with a pressure variation of +20 per cent.—*Electrical Engineering*, Oct. 14.



## Conduits New Home

We reproduce herewith a cut of the new home of "Galvaduct" and "Loricated" conduits, the brands manufactured by Conduits Company, Limited, 126 Don Esplanade, Toronto. This factory is conveniently situated for shipping, being on the lines of the Grand Trunk, Canadian Pacific and Canadian Northern Railways, while at the same time it is within easy reach of the business centre of Toronto. The factory is a solid white brick structure having a steel trussed roof with a clear



New Factory of Conduits, Limited

span of 80 feet x 150 feet in length, giving ample space for the handling of their product. At the north end of the building a second storey has been added, 80 x 35 feet, the office and stores department being situated on this floor. Every known convenience for the handling of the product has been installed with a view to improving the quality of the output. Many of the operations heretofore done by hand labor are now automatically performed, and chances of error are thereby eliminated.

The power equipment consists of a 40 h.p. steam boiler and 52 h.p. a.c. motors.

In view of the increased importance daily attaching to the installation of iron conduits in electrical work, and also in view of the satisfactory quality of this company's product in the past, a good increase in business will doubtless reward this latest expenditure on buildings and equipment.



## Electric Service Boxes

C. W. Bongard Company, Limited, 62 Wellington street west, Toronto, are placing on the market a new line of electric service boxes. They are made in sizes 11x6x3; 13x8x3; 19x10x4 inches. They will accommodate two or three wire fuse knife switches from 30 up to 100 amperes or National Code standard cutouts up to 12 circuits. All boxes are arranged for use of thumb-screw or lock.

It is claimed that 1,200 h.p. can be developed at Silver Creek Falls, and F. P. Charlebois, who controls the rights, proposes to construct an entirely modern developing plant there and transmit current to Collingwood and vicinity. The intention is to instal three 500 h.p. Pelton turbines direct connected to three 400 k.w. generators, and to transmit at 6,600 volts. Development will be under a head of 700 feet.

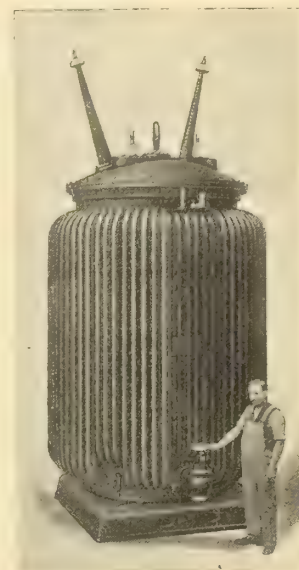
## English Company Opens Toronto Office

The Lancashire Dynamo & Motor Company, of England, have opened an office in the Peterkin Building, 152-4 Bay street, Toronto. This firm specializes in motors and dynamos only, their extensive works being fully employed in the manufacture of these. They have in this connection given special attention to the subject of electric driving for mines, machine tools, lumber and flour mills, as well as to the subject of synchronous and induction motors. Their Canadian representative is Mr. G. E. Mason, who has been with the firm since its organization and is responsible in no small measure for its continued success.

## Largest Self-Cooling Transformer Ever Built

The maximum size for which a transformer can be built self-cooling is limited by the amount of heat-radiating capacity for which the case can be designed. Standard cases with corrugated sides are regularly supplied with transformers up to from 600 to 750 k.v.a., but beyond this size the weight and size of cases becomes so great that some method, other than mere increase in size, must be resorted to in order to get the necessary radiating surface.

A type of case recently developed by the Westinghouse Electric & Manufacturing Company overcomes this great difficulty and is capable of being designed for a greater radiating capacity than has ever been attempted for a self-cooled transformer. It consists simply of a plain boiler-iron case, to the outside of which are welded a number of radiating tubes. These tubes are in the vertical position and are given a 90-degree bend at the top and bottom where they enter the case. The mechanical construction is very strong, so that there is practically no chance of ever springing a leak. Because of the ease with which the tubes can be widely separated from one another, the air circulates freely among them, and the efficiency of the radiating surface is considerably higher than for the ordinary corrugated case.



The Westinghouse Company has just built twelve 1,000 k.v.a., 100,000 volt transformers of this type, shown in the illustration, for the Southern Power Company; three of these transformers are for outdoor service, and nine for indoor.

Death & Watson report the following: The completion of a large electric sign for A. E. Rea & Company, of Ottawa; the construction in their factory of the largest electric letters ever built in Canada—they are 15 feet in height and will be erected in the city of Port Arthur; and the erection of a beautiful moving electric sign on the corner of King and Yonge streets, Toronto, advertising Hassan cigarettes. This sign contains more lamps than any other in Canada.

Of 9,500,000 telephones in the world, 7,000,000 are in America, 2,000,000 in Europe, and the other 500,000 are scattered over the remainder of the planet's surface.



# Current News and Notes

## **Aylmer, Ont.**

J. Bradley, town clerk, states that it is proposed to rebuild the electric light plant recently burned. Cost about \$15,000.

## **Arnprior, Ont.**

The McNab Rural Telephone Company has been formed to build a line from Glasgow Station here. The line will ultimately be extended to Stewartville, White Lake and Waba. Mr. Andrew Carswell, Glasgow Station, is president; Mr. Jas. Fraser, Arnprior, vice-president.

## **Berlin, Ont.**

The Board of Trade have under discussion the advisability of the electrification of the Galt & Elmira branches of the G. T. R. A committee was appointed to negotiate with the company.

## **Brandon, Man.**

The C. P. R. has now completed its private telephone system from Cartier, Ont., on the main line east, to Brandon, a distance of 1,045 miles. This is the nucleus of a system which will stretch from the Atlantic to the Pacific, with telephones all along the company's branches.

## **Brockville, Ont.**

After paying all running expenses, debenture interest, \$5,303 and \$7,597 on the debenture debt of the plant, the Brockville Light and Power Department, owned and controlled by the municipality, finished the past year's operations with a net surplus of \$664. The department had a revenue of \$51,915 from the sale of gas and electricity, and nearly \$4,000 was allowed for depreciation. The bad debts amounted to only \$26.

## **Brantford, Ont.**

A Brantford citizen, Dennis Hogan, has given notice that he will make application for an injunction to restrain the city from entering into a contract with the Dominion Power & Transmission Company on the ground that a contract already exists with the Hydro-Electric Power Commission.

Four new sections are being added to the Independent Automatic Exchange, rendered necessary by the rapid growth of the telephone business here. The manager of the Brantford Company expects to have 1,500 subscribers within a year.

The Western Counties Electric Company, 12 South Market street, have had plans prepared for the erection of a new transformer station on Murray street, to cost \$4,500.

## **Calgary, Alta.**

The city is asking the ratepayers for \$40,000 for the extension of the street railway.

Tenders will be invited by this municipality for six additional new steel cars of the pay-as-you-enter type. They are to be five feet longer than the cars now in use, and will be equipped with air brakes. Exclusive of the motors, it is expected that they will cost approximately \$25,000, f.o.b. Calgary, for early spring delivery. J. T. Child is the city engineer.

## **Chilliwack, B.C.**

The Chilliwack Telephone Company, Limited, at its annual meeting, held recent, were able to show such an excellent financial statement that a dividend of 7 per cent. on the paid-up capital of the company was declared.

## **Cornwall, Ont.**

The project to dam the Long Sault rapids of the St. Lawrence and to develop the power for electrical use will come before Parliament this session in the form of a private bill for the incorporation of the St. Lawrence Power Transmission Company. The capital is stated to be \$250,000 and extensive powers are asked for, including the right to export electricity to the United States.

## **Edmonton, Alta.**

With the opening of the Grand Trunk Pacific office recently, Edmonton has three telegraphic lines of communication with outside points. The G. T. P. will handle commercial messages from all eastern points.

The Edmonton Radial Railway Company expects to place contracts within the next six months for constructing 10 miles of single and double track.

It is announced that wireless telegraph stations will be established in Port Arthur, Winnipeg, Regina, Battleford, Calgary, Saskatoon and this city.

The provincial telephone system in Alberta has been extended so vigorously during the past season that the total appropriation of \$600,000 is exhausted. Work, however, will proceed without intermission. To date 500 miles of rural lines have been completed this year, to which it is hoped another 200 miles will have been added before the winter sets in.

## **Fort Saskatchewan, Sask.**

The power house was destroyed by fire recently. Estimated loss, \$3,000.

## **Fort William, Ont.**

W. F. Hogarth, president of the Mount McKay and Kakabeka Falls Railway Company, and M. H. Braden, one of the directors of the company, returned recently from Minneapolis, where they had been purchasing equipment for the line. Work on the line is going ahead as rapidly as men and teams can crowd it.

## **Fort Frances, Ont.**

Three car loads of electrical machinery for the Canadian power house have arrived from Hamilton, Ont., and are being placed in position. The present intentions as far as can be learned of the power company is to install four of the nine units or a total of 6,800 h.p., all of which will be transmitted to the American side to run the paper mills and furnish lights and power for International Falls. Fort Frances will get enough power to furnish light for the town.

## **Galt, Ont.**

Engineer Merrill's estimate of the present value of the Galt Gas & Light Company's plant in so far as it can be utilized for distributing Niagara power is \$34,900.

## **Goderich, Ont.**

Mr. J. W. Moyes, for the Ontario West Shore Railway, has purchased from the G. N. W. the telegraph line from Goderich to Kincardine. The line will be equipped with telephone instruments and used as a despatching system by the Ontario West Shore Railway Company.

It is expected that track laying on the Ontario West Shore Electric Railway, be-

tween Kincardine and this town, will commence shortly. J. W. Moyes, president.

## **Guelph, Ont.**

The city of Guelph gets a profit of \$5,000 from its municipally owned street railway system after paying all expenses and deducting \$3,000 to build a new bridge to the Agricultural College.

The People's Railroad have under consideration the building of a railway through Rockwood to Erin, and connecting the city with Puslinch Lake and Hespeler, where it will join the Galt, Hespeler & Preston Railway. A charter has already been granted for the line to Arthur, through Elora and Fergus.

## **Hamilton, Ont.**

The time for the building of the John Patterson Radial Railway to Galt has been extended to December, 1911.

The proposed reconstruction of the street railway has been approved by the Board of Works and the matter referred to the city council. The specifications under which work will be commenced early next year call for tracks similar to those relaid on James and Baron streets this year, excepting the fact that lighter rails will be used, weighing 80 lbs. to the yard; also as to whether wood blocks or brick will be laid.

## **Hartland, N.B.**

John E. Stewart and Hon. A. B. Donworth are interested in a plan to build an electric railway from Hartland to For-  
eston, N.B.

## **Ingersoll, Ont.**

Negotiations are under way having in view the acquiring by the municipality of the plant of the Ingersoll Electric Power & Light Company.

## **Kamloops, B.C.**

A project to extend the telephone to Grande Prairie, thus giving through communication to Vernon, is being promoted by the Board of Trade, who are working with Mr. Halse, superintendent of the British Columbia Telephone Company.

## **Kenora, Ont.**

The value of the east branch of the Winnipeg river is being subjected to arbitration. The river is owned half by the Hudson's Bay Company, half by the Keewatin Power Company. The town of Kenora expropriated the property for power purposes but cannot determine the correct value. In evidence taken before the arbitrators the property is being valued by different expert engineers all the way from \$10,000 up to \$250,000 or more.

## **Lacombe, Alta.**

The Blindman River Electric Power Company have sold their entire plant to the Town of Lacombe, which will proceed at once to repair the dam on the Blindman river and install a steam auxiliary plant in the town limits. The council have secured the services of Mr. E. J. Tett as manager and engineer of the plant. Mr. Tett has for some years been secretary-treasurer and manager of the Blindman River Electric Power Company, Limited.

## **London, Ont.**

The government may allow the taking of a census in London with a view to deciding the question of whether there are



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the necessary 50,000 inhabitants without which a Sunday street car system cannot be initiated.

The \$70,000 underground system bylaw for Niagara power will be submitted to the ratepayers at the municipal elections.

The recent decision of the Dominion Railway Commission is that the consent of that body must be obtained before the transmission line of any power company can cross the lines of the Bell Telephone Company, or any other such line.

The purchasers of the Southwestern Traction Co. are seeking incorporation as the London & Lake Erie Railway & Transportation Co. Capital, \$2,000,000. Provisional directors: W. K. George, G. B. Woods and S. Jones, all of Toronto; Dr. A. McKay, Ingersoll; F. G. Rumball, J. Purdom, both of London, Ont., and A. E. Thompson, of Cleveland, Ohio. Their plans include considerable extensions.

#### Montreal, Que.

The Montreal & Southern Counties Electric Railway, connecting Montreal and St. Lambert, was opened on November 1. The length of the road is 3 1-2 miles. An extension to Longueuil, a distance of 3 miles, is well under way and will be completed by the middle of 1910. It is proposed to build two other lines, one from St. Lambert to Chambly, 12 miles, the other to Laprairie, 7 1-2 miles. S. T. Willett is president and W. B. Powell managing director.

The city council will submit a by-law to the property holders on December 21, asking for permission to spend 2,000,000 to provide a municipal electric lighting and power plant.

President Sise of the Bell Telephone Company of Canada states that his company is in no way concerned with the big merger between the Western Union and the American Telegraph and Telephone Companies.

Tenders will be received up to Wednesday, December 1st, on 1,000 horse power water tube boilers, 200 pounds pressure, for the Saraguay Electric & Water Company. Charles Brandeis, 4 Phillips Place, consulting engineer.

Tenders for the generators, switchboard and power wiring for the Montreal Technical School are now being received and plans and specifications may be seen at the office of the architects, Messrs. Saxe & Archibald, 59 Beaver Hall Hill.

#### Nanton, Alta.

A bylaw to appropriate \$16,000 for the construction of an electric light plant has been passed.

#### Nelson, B.C.

The Bull River Falls Power & Light Company are installing a 10,000 h.p. plant in the Crow's Nest region. Light and power will be supplied to all the neighboring towns. A short electric railroad is also contemplated connecting the falls with Jaffray, Ft. Steele and Cranbrook.

#### New Westminster, B.C.

The B. C. E. R. is planning the erection of a new station which will be the terminus for the Fraser Valley division.

#### New Dundee.

At the annual meeting of the New Dundee Rural Telephone Company, held recently, a dividend of 10 per cent. was declared and it was stated that the earnings were double that amount. There are 100

subscribers on the rural line and 60 connections with the Bell Company.

#### Ottawa, Ont.

The location survey has been completed for a distance of 18 miles in connection with the Ottawa-Morrisburg Electric Railroad.

The Kingston, Smith's Falls and Ottawa Railway Company will apply for an act extending the time within which the company may commence and complete its proposed line of railway. The Ottawa Valley Railway Company will seek the right to increase its bonding power and to deal in electric power.

#### Oshawa, Ont.

A syndicate of Oshawa manufacturers will apply to the Dominion Parliament for a charter for an electric railroad to connect Whitby, Bowmanville and Oshawa with Toronto.

#### Prince Rupert, B.C.

The Dominion Government purpose establishing a wireless station here.

#### Peterborough, Ont.

It may be interesting to those who are asking what rate per h.p. Peterborough ought to look for, that Fenelon Falls will give power delivered at the factory for \$10 per h.p. and Lindsay offers it at \$15.

#### Port Arthur, Ont.

H. S. Acres, engineer, of Toronto, has plans ready for the new electric power sub-station.

Mr. Justice Clute has granted an injunction restraining the city of Port Arthur, until the trial of the action, from entering into a contract with the Hydro-Electric Power Commission. His Lordship says that in his opinion the council have no power to enter into the proposed contract. The decision of Justice Clute will be appealed by the municipality.

#### Phoenix, B.C.

The reports of engineers detailed by the C. P. R. to investigate as to the advisability of electrifying their branch line here have been so satisfactory that the project is seriously considered. The proposed initial electrification is to the Granby smelter.

#### Quebec, Que.

Plans are being commenced by the Quebec Railway, Light & Power Company for the construction of a sub-station in St. Anne de Beaupre, Que., contracts for which will probably be placed this year.

The Quebec Railway, Light & Power Company expects to place contracts early next year for the construction of a car house. E. A. Evans, manager.

#### Revelstoke, B.C.

The bylaw for the expenditure of \$89,000 for the improvement of the power plant has been passed.

#### Renfrew, Ont.

The proposed municipal hydro-electric plant will be constructed by day labor under supervision of Engineer McRae, Citizens Building, Ottawa; I. K. Rochester, Town Clerk.

#### St. Thomas, Ont.

The M. C. R. is arranging to substitute electricity for steam on its St. Thomas yard engines.

#### Sherbrooke, Que.

W. Hibbard, who represents the Montreal capitalists who are trying to secure the Sherbrooke street railway, is negotiating to secure a water power which the city

now controls. If power can be had the system will be extended in the city by about eight miles. The city council has placed a value of \$22,000 on the water power. The company asks, if purchase goes through, a 60-year franchise for the railway.

#### St. John, N.B.

The New Brunswick Telephone Company, which controls practically all the telephones in this province, has increased the price of both office and house phones, \$5 in the one case and \$7 in the other. Subscribers contend that the legislature has the right to fix the rate and the matter will likely be taken to the courts.

#### Simcoe, Ont.

A resolution was passed at a recent meeting of the town council to grant permission to Brantford-Port Dover Electric Railway to construct a line through the town of Simcoe.

#### Stratford, Ont.

Mr. W. A. Bugg promoter of the People's Railway, states that the line from Stratford to Guelph is assured. Already all the municipalities between the city of Stratford and Berlin have passed by-laws supporting the road, and the city of Stratford is to vote in the very near future. A charter has already been granted by the Legislature for a line from Guelph to Arthur through the villages of Elora and Fergus.

Application will likely be made at the next session of Parliament for permission to build other lines which will connect the cities of Stratford and Guelph with Rockwood, Hespeler, Galt and Preston.

An agreement was reached some time ago between the city and the Stratford Gas Company to refer to three arbitrators the question of the price the city shall pay the Gas Company for their electric plant, business and rights, each party to the agreement to appoint one arbitrator who shall themselves name the third member. Both the company and the city agree to abide by the finding of the Commission. The arbitrators are: For the company, E. J. Philips; for the city, E. B. Merrill; third member, H. A. Moore. A decision will be given by December 1.

#### Trenton, Ont.

The voting on the power by-law here resulted in a defeat of the measure by a majority of 239, there being 150 votes for and 389 against the measure.

#### Toronto, Ont.

A report submitted to the City Council by Engineer W. J. Moyes respecting the construction of an underground street railway system to relieve congestion in the central parts of the city may be submitted January 1 to the ratepayers for their approval. The proposed length of the submerged line is about 3 3-4 miles and would cost in round numbers \$5,000,000.

Electrical engineers of the municipalities which are to take power from the Hydro-Electric Power Commission have approved a report recommending luminous arc lamps for street lighting in business districts, and some type of tungsten incandescent lamps for residence lighting.

Mr. Walter Sterling, City Auditor, states that about \$315,000 has been expended to date on construction work in connection with the Hydro-Electric development.

City Engineer Rust has recommended the corner of Duncan and Nelson streets as the site for an electric sub-station.

The Street Railway have a permit to erect car barns on Lansdowne avenue near



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Contractor John Witchall states that all the material for the civic power plant will be purchased from Toronto. A number of transformer stations will be erected in the city.

### Victoria, B.C.

There is a project on foot to establish a long distance wireless system along the coast and the Pacific Radio Wireless Telephone Company, Seattle, Wash., will commence work on stations at Victoria and Vancouver shortly.

### Vancouver, B.C.

As a result of the recent disastrous accident on the B. C. Electric Railway, the City Council has ordered the instalment of a more efficient form of fenders on cars operating within the city. Such fenders to be in use within one month.

Tenders are being called for the erection of a structural steel tower for wireless communication by the Pacific Radio Company, Seattle, of which J. H. Smith, 1122 Government street, is the representative.

A. Richardson, of the purchasing department of the Vancouver Island Power Company, is calling for tenders for a supply of approximately 600 cedar telegraph poles. Bids close December 1st. Plans at offices

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of the company. Poles will not be required until the summer.

The B. C. E. R. Company will let contracts within a few weeks for constructing an extension to its car house shops. R. H. Sperling, manager.

### Waterloo, Ont.

Architect Moogk, this town, has submitted plans of new power houses to the council.

### Windsor, N.B.

The local farmers' line, which costs only \$10 per year per phone, is reported to be a financial success. Connection is made with Woodstock, 20 miles distant, at a cost of 3 cents.

### Welland, Ont.

The N. St. C. & T. Railway is understood to be planning extensions from Fort Erie to Port Colborne.

An electric plant for the production of iron ore by electrolysis, after reduction at a dull red heat by hydrogen, and to be known as the Electro Steel Co. of Canada, is locating here and work on the buildings begins at once. The location chosen is the junction of the Welland Canal with the canal feeder where 50 acres have been secured. Contract for power has been entered into with the Niagara Falls Power Company. A daily output of 1,000 tons is promised.

### Windsor, Ont.

The first of six electric locomotives for use in the Detroit river tunnel has been accepted by the M. C. R. The locomotives will each weigh 100 tons, develop 35 miles an hour and are said to be the most powerful ever designed for operation by direct current.

### Warton, Ont.

The Warton & Lake Charles Telephone Company are building a line from Wolsley to Warton via the 19th. They start business with twenty subscribers.

### AWARDED.

### Bracebridge, Ont.

Contracts were awarded as follows for machinery and construction for the new power development at Wilson's Falls:—"A," general work (dam, forebay, foundations, etc.) Canadian Contracts, Limited, Toronto, \$19,341; "B," hydraulic division, Wm. Kennedy & Sons, Owen Sound, Ont., \$18,100; "C," electrical division, the Canadian General Electric Company, Toronto, \$7,427. Alexander C. Salmon, Town Clerk.

### Lacombe, Alta.

Contracts have been awarded to Councilor Hobley for repairing the dam at a cost of \$4,000, and to the Watrous Engine Works Company, of Brantford, Ont., for an auxiliary steam plant. Mr. E. J. Tett, manager.

### Montreal, Que.

The Shawinigan Water Power Company have awarded the contract to the Canadian Westinghouse Company, Limited, Hamilton, Ont., for five 300 kw. 30-cycle three-phase transformers.

### Port Arthur, Ont.

Walter Oliver has been awarded the contract to build the new car barns on a bid of \$24,656. The Barnes Hardware Company will do the plumbing and heating.

### St. Timothee, Que.

The Nova Scotia Construction Company has been awarded a sub-contract amounting to approximately \$200,000 in connection with the hydro-electric development of the Canadian Light & Power Company.



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### Wolfram Tungsten Lamp

In this number of the "Electrical News" will be found the announcement of the "Wolfram" tungsten lamp (made in Germany) for which the P. H. Klein, Jr., Company, of New York, are sole expert agents on the American continent. This lamp, however, is not new or experimental, as it is in its fourth year on the markets of the world, for over two years of which it has been exploited in the United States by this same company, during which time it has achieved great success. This firm has been encouraged by its success to announce now its bid for the business of the other American countries, and has perfected its arrangements for the immediate shipment thereto and the promptest attention to all details of any orders received in this field.

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dition to limiting the length of the line and amount of power that can be transmitted.

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(Courtesy of the National Carbon Company, Cleveland, Ohio.)

Date.	Light.	Date.	Extinguish.	No. of Hours
Dec. 1	5 00	Dec. 1	10 20	5 20
2	5 00	2	11 30	6 30
3	5 00	4	0 30	7 30
4	5 00	5	1 30	8 30
5	5 00	6	2 30	9 30
6	5 00	7	3 30	10 30
7	5 00	8	4 30	11 30
8	5 00	9	5 30	12 30
9	5 00	10	6 30	13 30
10	5 00	11	6 30	13 30
11	5 00	12	6 30	13 30
12	5 00	13	6 30	13 30
13	5 00	14	6 30	13 30
14	5 00	15	6 30	13 30
15	5 00	16	6 30	13 30
16	5 00	17	6 30	13 30
17	5 00	18	6 40	13 40
18	5 00	19	6 40	13 40
19	10 20	20	6 40	8 20
20	11 30	21	6 40	7 10
22	0 50	22	6 40	5 50
23	2 00	23	6 40	4 40
24	3 20	24	6 40	3 20
25	4 30	25	6 40	2 10
26	No Light	26	No Light	
27	" "	27	" "	
28	5 10	28	8 00	2 50
29	5 10	29	9 10	4 00
30	5 10	30	10 10	5 00
31	5 10	31	11 20	6 10

Total .....256 40

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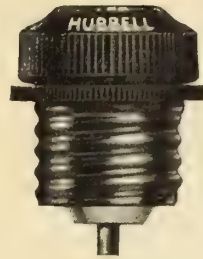
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—a tiny type for use with high-class portables

—a plug with a separable cap that pushes in *and stays in*

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—a plug that's absolutely trouble-proof

—a plug that projects but one-half inch from the socket

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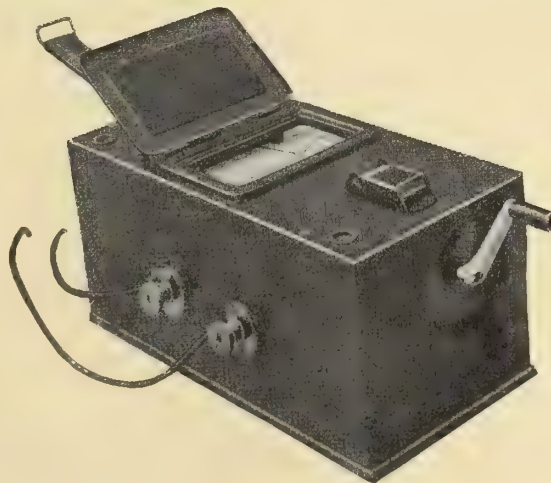
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**Electrical Contracts Awarded**

**Calgary, Alta.**

The contract for about 8,000 pounds of wire for the balance of this year's electric light work has been awarded to the Canadian General Electric Company.

**Chicoutimi, Que.**

The Chicoutimi Pulp Company has awarded contracts for the construction of an electric railway from its mills to the limits in the Riviere du Moulin district.

**Cobalt, Ont.**

The Jenckes Machine Company, of St. Catharines, have been awarded the contract for supplying and installing the hydraulic machinery for the electric plant.

**Fort Frances, Ont.**

W. W. Canaday has been awarded the contract for electric light poles.

**Montreal, Que.**

The Western Canada Power Company, through their purchasing agents, the Montreal Engineering Company, recently awarded the contract for their complete requirements of water wheels and turbines to the Escher-Wyss Company, of Zurich, Switzerland. Allis-Chalmers-Bullock, Limited, will supply a 450 kw. generator to be installed in their temporary construction plant. Tenders for the balance of the electrical equipment required have been received, but no action regarding these will be taken for some time. Tenders are now being called for the necessary supply of wire.

The Mexican Light & Power Company, with head offices here, have awarded a contract to Pearson & Sons, England, for electrical development on the Conclas river, Mexico, which will cost \$5,000,000.

The Canadian General Electric Company, Toronto, has been awarded the contract for the supply of a 500 kw. steam turbo-generator for the Saraguay Electric Company, of this city.

**New Westminster, B.C.**

W. W. Forster, this city, has been awarded the contract for the repair shops to be built by the B. C. E. R. The shops will be 90 by 180 feet and will have three tracks.

T. R. Nickson & Company have secured the contract for the erection of the substations along the British Columbia Electric Railway extension from New Westminster to Chilliwack. Total estimated cost, \$250,000.

**Pointe aux Trembles, Que.**

The parish of Pointe aux Trembles has awarded an exclusive franchise to the Saraguay Electric & Water Company to furnish electricity for lamps and motors. The territory extends from Bout de l'Isle to Longue Pointe, covering about 35 miles on the island of Montreal.

**Regina, Sask.**

The contract for the installation of government telephone exchanges at Hanley and Melville, has been awarded to Simpson & Craig, of Virden, Man.

**Toronto, Ont.**

The tender of the Canadian Westinghouse Company, of Hamilton, for the electric motors for the electric pumps to be installed at the main pumping station and high level pumping station, has been accepted by the Board of Control. The successful tender was for \$107,765. The next lowest tender was from a Glasgow firm, \$120,000.

**Verdun, Que.**

I. Collins, of Montreal, Que., has received the contract for the new municipal power house here.

## **Electric Repair & Contracting Co.**

**119 Lagachetiere Street West  
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Makers of  
**Commotators  
Panel Boards  
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(Ex. Examiner Canadian Patent Office.)

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## One D.C. Generator

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Amperes	-	-	375
R.P.M.	-	-	900

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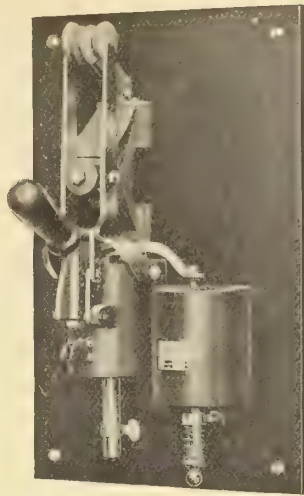
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are Perfect

## Circuit Breakers

Simple in Construction—Simple Mounting  
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Break — High-class Workmanship — Minimum Maintenance Cost.

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but have you ever seen over  
200 good Panel Boards in  
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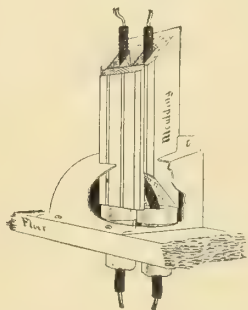
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Why use up the leads? It costs time and money to replace them. Dossert connectors can be disconnected with a wrench, leaving the ends of the wires in perfect condition.

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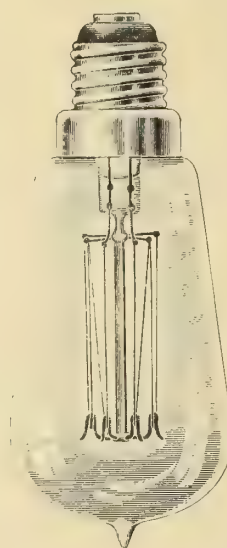
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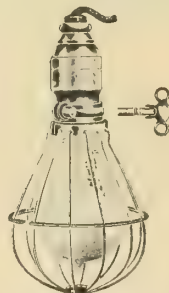
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prevent loss of lamps  
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Ask your local supply  
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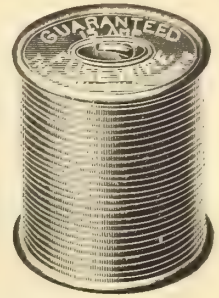
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7 085 H. T. 3 core 7000 volt paper lead covered cable.

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Canadian Factory  
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# COMPLETE EQUIPMENT RELIABLE APPARATUS



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Kellogg Telephones and Switchboards are Kellogg from box to switch-hook and from cabinet to jack strip. Not picked up here and there, half manufactured, half bought, or fitted out with untried novelty parts or attachments that often make operation complicated and uncertain.

Kellogg Telephones are built from start to finish in our own factory.

The Kellogg Main Factory contains 118,000 square feet live, used space, fitted with complete equipment for the best production of every telephone part.

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Two warehouses, 41,000 square feet, hold the raw material and line supplies, arranged for quick assembling and filling of every order, large or small. We consider the prompt shipment of an order as important as the correct filling of it.

With every facility for the best production of telephones and switchboards, the reasons for the unequalled records and long life of the finished apparatus sold from the Kellogg plant are evident.

**Send for our Illustrated Bulletins covering every detail of Telephone work. Mailed free on request.**

## KELLOGG SWITCHBOARD & SUPPLY COMPANY

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# The Magneto Telephone That Never Encounters a Superior

## And Rarely Meets an Equal

Point for point we show you here the reason why this Magneto Telephone gives the utmost value and the quality that means dependable unlimited service. No matter how critical you are every detail will be found perfectly designed—and several other useful features provided that no other Magneto Telephone has. We must insist that you make a comparison and test in your own way. Your unbiased verdict concerns us most keenly—let us have it soon.

No. 7 Line Binding Posts and Carbon Block Lightning Arrester

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No. 14-A Receiver—The acknowledged standard for any kind of Telephone work. Receiving qualities well defined and distinct. Permanent adjustment—no castings—uniform ground pole pieces. Composition shell. Green silk cord.

No. 34 Hookswitch—A detachable short lever self-contained vertical hookswitch with no floating contacts. Heavy German Silver springs with platinum contacts.

Receiver cord machine screw terminals. Accessible and in no way interfere with removable generator and shelf.

A screw lock that fastens door firmly. Has a spiral tension spring that keeps screw end back from lock bracket when swinging door is closed.

No. 99 Key—Add any time or specify when wanted. With this additional feature the parties on the line are able to call each other without calling Central or they may call Central without calling anyone else on the same line.

Screw Hole Metal Bushings for all mounting screws. Prevent wood from splitting and being marred if frequently mounted. A little thing but a convenience.

Fahnestock Spring Battery Clips—A quick making terminal connection that will not come unfastened. The battery wire coils are cotton insulated and beeswaxed. All these accessories improve the design and assure dependable service.

No. 24 Generator—Its high voltage output and greater permeability make it the best generator for all kinds of service. Laminated steel armature properly insulated and carefully wound with silk insulated magnet wire. Accessible front terminals and machine cut gears.

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No. 20-A Induction Coil—Both windings are so proportioned that transmission over long and short lines is a maximum for clearness, and as a receiving instrument the highest degree of efficiency is developed. Instantly removable.

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No. 10 Transmitter Arm—Indestructible and detachable arm made of cold drawn steel—including the base of one piece. Richly enameled and hand finished.

Detachable Writing Shelf—When telephone is knocked down this part packs in battery compartment with transmitter arm and transmitter—switchhook—crank handle and mounting screws.

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Perfection in every detail plus the greatest compactness—extreme accessibility—and uniform assembly sum up the values in our No. 896 Compact Type Magneto Telephone—superior to any—equalled by none.

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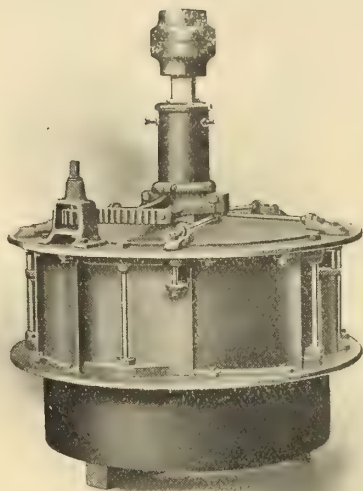
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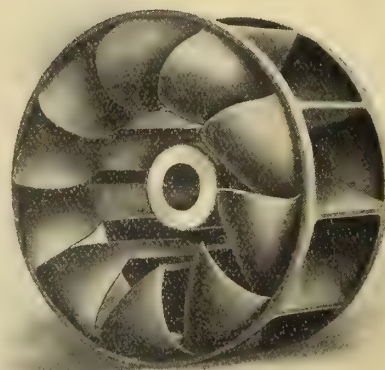
# The "Canadian" Turbine Water Wheel



We invite the closest inspection of these cuts and feel sure that the principles of both our runner and gate, rig will appeal strongly to you.

Get our references and visit our shops: You cannot spend too much time and money in selecting the best water wheel: Your whole investment depends on it.

Eighty per cent fully guaranteed under working conditions and an ideal quality of power.



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Quality has been the watchword of this firm ever since we started business and how well we have maintained it will be amply demonstrated by a trial order. You will ever afterwards be sending in repeat orders for "more of the same kind."

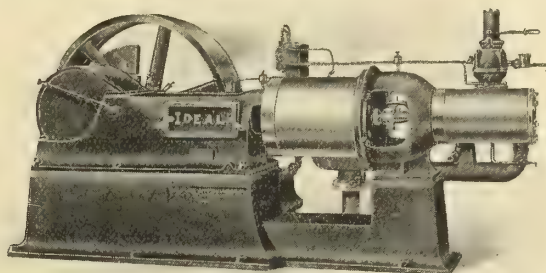
We buy all the burn-outs we can get our hands on.

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# Ideal High-Speed Steam Engines

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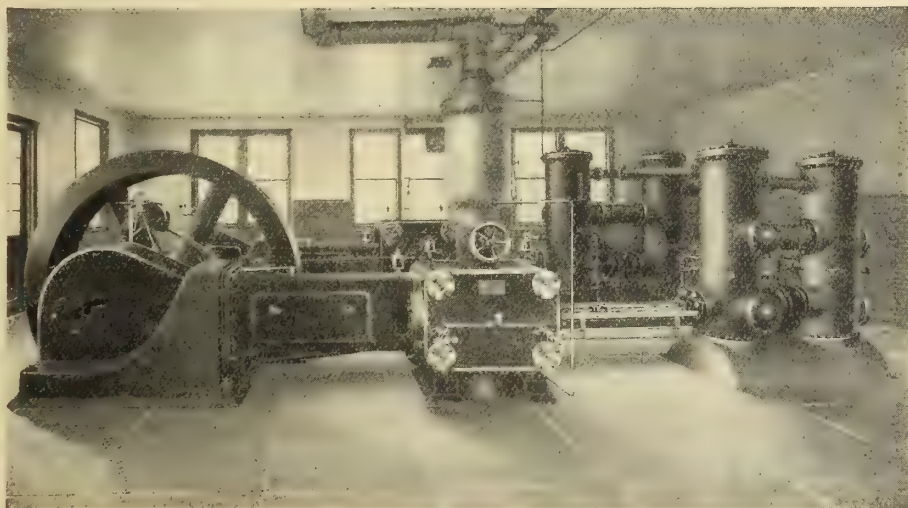
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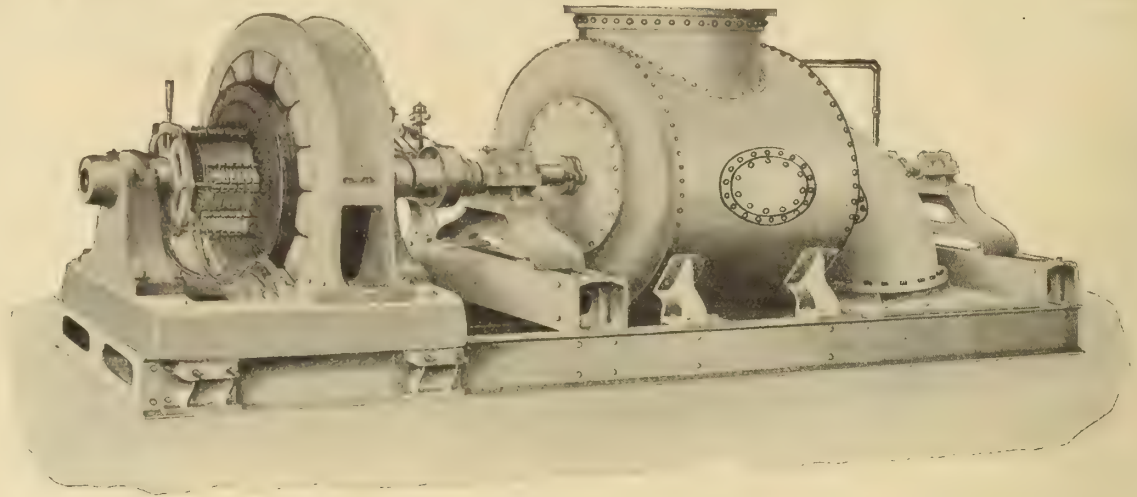
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Wheel connected direct to dynamo.

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May we send you references and Bulletins?

**The Madison Williams Mfg. Co., Limited**  
LINDSAY, ONTARIO, CANADA

High speed

## McEwen Automatic Engine



Three Engines in this Plant

In Simple and Compound  
Units

Direct Connected and Belt  
Driven

### Guarantee

The Engine shall not run one revolution slower when fully loaded than when running empty, and a reduction of Boiler pressure from the greatest to that necessary to do the work will not reduce the speed of the engine one revolution. Any engine failing to meet this guarantee becomes the property of the purchaser upon the payment of one dollar.

**Waterous Engine Works Co.**

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Winnipeg, Man.

B. C. Agent  
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BRANTFORD, CAN.



**A Very Merry  
Xmas**

**A  
Very  
Merry  
Xmas**

**A Prosperous  
New Year**

The hearty support of our many friends and customers during the past twelve months has enabled us to double our business, and the many commendations received have nerved us to resolve

**"Nineteen-Ten, Likewise"**

**Your good will is everything**

In this season of good cheer, we wish to thank you, every one, for your past co-operation and the support we feel sure you will give us during the coming year.

**Wishing you all the Compliments of the Season**

We are, yours very truly,

**The Electrical Maintenance and Repairs Co.  
Toronto**

# Renold Silent Chain Drives

(MANCHESTER, ENGLAND.)

**Will Overcome Transmission Troubles**

Montreal, Feb. 8th, 1909.

MESSRS. JONES & GLASSCO,  
201 St. Nicholas Bldg., Montreal, Que.

## RE RENOLD SILENT CHAIN DRIVE

Gentlemen: -

In reply to your inquiry of Jan. 30th, I may say that the Renold Silent Chain Drives we have installed are giving every satisfaction.

Our first drive was installed to replace a 12 inch belt which was giving us trouble on account of short centres; this chain has run continuously for four years without the slightest trouble.

Our second drive was installed on a mixing machine doing heavy duty and which had previously broken up two sets of spur gearing; this chain has run over three years with no sign of wear yet.

Our third drive was installed on a calendering machine after breaking two sets of helical gears, and this has been so successful that we are now installing two more similar drives.

I would be perfectly willing to make an appointment with any person genuinely interested and show him the drive in operation.

**The above is a copy of letter from a prominent Canadian Manufacturer.**

CANADIAN AGENTS

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## Long Nights

## Heavy Loads

You are reminded that it is due time to have that spare armature repaired or a new commutator put on it. Our repairs are made by the best mechanics that we are able to procure and we use only the best material.

Our aim is:—Once a customer, always a customer.

We can keep you running while we make your repairs.

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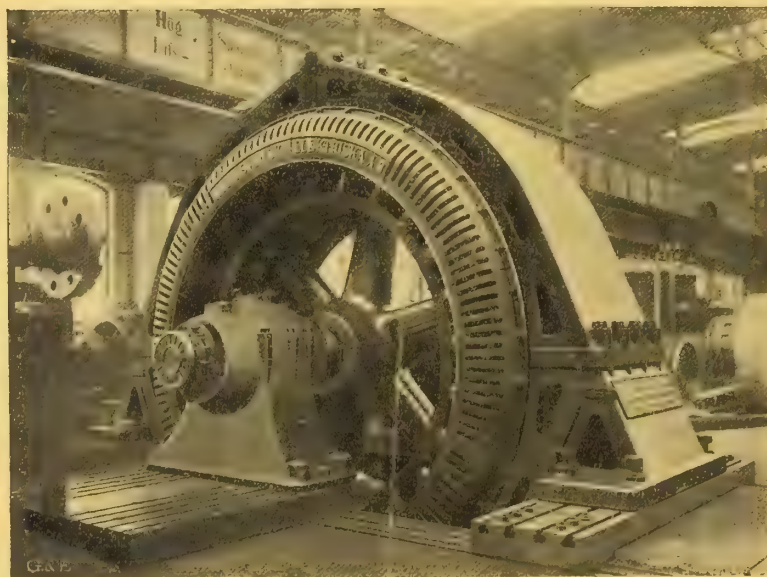
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